

POPULATION EDUCATION

A NATIONAL SOURCE BOOK



POPULATION EDUCATION: A NATIONAL SOURCE BOOK (VOLUME -I)

Editors

C. Seshadri J. L. Pandey



National Council of Educational Research and Training

April, 1991
Baishakh, 1913

© National Council of Educational Research and Training, 1991

Published by the Secretary, National Council of Educational Research and Training,
Sri Aurobindo Marg, New Delhi - 110016 and Printed at Allied Printers,
B-56, Naraina Industrial Area, Phase II, New Delhi - 110028, India

FOREWORD

Population education is today one of the important innovations in the area of education. In India, it has spanned through almost the entire spectrum of school education in a relatively short period, and concerted efforts are afoot to integrate its elements in other vital sectors of education, namely, non-formal education, adult education and university education. In view of this expansion, a variety of activities relating to different aspects of population education are regularly organised for realising one or the other objective of this endeavour. A number of different categories of clientele have been involved in these activities.

Although considerable amount of literature on population education has been prepared and these materials are being used for specific purposes, a need has been felt for long to develop a comprehensive volume that can be used as a source of information relating to all the major facets of population education. In the absence of such a source, various target groups feel constrained in acquiring comprehensive understanding of the complex field of population education in all its richness: organised knowledge-facts, concepts, principles, laws, theories and messages pertaining to population dynamics, socio-economic development, environment, health and nutrition, biological factors, family life and others and to master professional competencies and skills to organise meaningful learning experiences and to evaluate them.

In order to meet this need, efforts were initiated at the national level by the National Council of Educational Research and Training (NCERT) to develop a national source book on population education. The general approach, the organisation, the details of the contents of the source book and a plan of action were worked out at two workshops attended by teacher educators, population education experts and specialists drawn from universities, research institutes and professional organisations. The workshops were also attended by a UNESCO expert from the Regional Advisory Team at Bangkok and representatives from the Ministry of Health and Family Welfare. Based on the plan of action, authors were commissioned to write different chapters of the source book. The first draft of the materials was reviewed at a workshop attended by the authors, subject specialists, teacher educators and population education experts. The drafts were revised by the respective authors on the basis of exhaustive comments and suggestions made at the workshop. The materials thus received were edited and organised into two volumes.

I have great pleasure in presenting this publication, *Population Education: A National Source Book*, in two volumes, to various user groups. It is primarily addressed to teacher educators, teachers, curriculum development specialists, functionaries engaged in materials development, orientation and organisation of learning experiences and researchers. These volumes may also be of use to the people involved in adult education, university education, health and family welfare programmes and such other activities.

The present volumes are the outcome of a cooperative academic venture, of which the authors of different chapters are the mainstay. I express my deep sense of gratitude to them for their warm intellectual response to this endeavour. I am also thankful to the participants of the workshop for their contribution in planning the format and reviewing the draft of the Source Book.

I take this opportunity to gratefully acknowledge the goodwill and ready help we received from the Regional Advisory Team on Population Education of the UNESCO Principal Regional Office for Education in Asia and the Pacific, Bangkok throughout the long period of preparation of this publication. I am particularly grateful to Dr. R.C. Sharma, Regional Adviser for In-School Population Education for his contribution to this venture.

I would like to thank the United Nations Population Fund (UNFPA) for its support in bringing out these volumes.

The work for preparation of the Source Book was initiated at the Regional College of Education (RCE), Mysore in close collaboration with the Population Education Unit at the NCERT, New Delhi. I wish to express my thanks to the Principal of the RCE for his cooperation, and specially to Dr. Sudha V. Rao, Reader in the RCE for coordinating the activities at the initial stage.

I acknowledge with appreciation the arduous work put in by Dr. C. Seshadri, Dean of Instruction, RCE, Mysore and Dr. Jawaharlal Pandey, Reader in Population Education at the NCERT, New Delhi. While both of them edited these volumes, Dr. Pandey coordinated various activities connected with the publication and also did content editing of some chapters. They deserve special mention.

I am thankful to the faculty and staff of the Population Education Project at the NCERT, and more particularly to the National Coordinator Prof. D.S. Muley for his leadership and guidance.

I am grateful to Mr. B.K. Pattanaik, Junior Project Fellow for his assistance in proof reading and other related works.

Dr. K. Gopalan

Director

National Council of Educational
Research and Training

December 1990

CONTENTS

	Page No.
Foreword	i
List of Tables	v
List of Figures	vii
About the Source Book	viii
Section-I: Population Education	
1. An Overview of Population Education R.C. Sharma	1
2. Population Education: The Indian Perspective B.S. Parakh and J.L. Pandey	25
Section-II: Population Situation	
3. Population Dynamics Mahendra K. Premi and Prem C. Saxena	41
Section-III: Population and Development	
4. Population and Development in Post-Independence India L. Ramachandran	115
5. Women and Development K. Saradmoni	129
Section-IV: Environment and Resources	
6. Population, Environment and Resources C.K. Varshney	151
Section-V: Health and Nutrition	
7. Population and Health S.D. Gupta and A. Bhargava	185

	Page No.
8. Population and Nutrition S.G. Srikantia	209
 Section - VI : Family Life	
9. Family Life Education: Aspects of Human Sexuality Mahinder C. Watsa	231
10. Human Reproduction R.N. Gupta	257
 Section - VII : Educational Development	
11. Population Change and Education in India A.S. Seetharamu	277
 Appendices	
Appendix I : Demographic Glossary	297
Appendix II : Statistics on Population and Development	300
Appendix III : Environment: Information Sheet	324
Appendix IV : Research Findings on Population and Nutrition	327
Appendix V : Growing up : Information Sheets	330
Bibliography	361
Contributors	387
Index	389

LIST OF TABLES

- 3.1 Estimates of size and growth of world population, 1750-1989
- 3.2 Estimated population of more developed and less developed regions, 1750-1989
- 3.3 Estimated population of less and more developed regions, 1975, 1980, 1985 and 1989
- 3.4 Estimates of India's population, 300 B.C. to A.D. 1871
- 3.5 Population of India and its growth, 1891-1981
- 3.6 Distribution of population and area in different states and zones of India, 1901-81
- 3.7 Percentage distribution of population and area in different states and zones of India, 1901-1981
- 3.8 Population growth in various zones, states and union territories, 1901-81
- 3.9 Density in various states and union territories, 1901-81
- 3.10 Population of India by rural and urban residence by decadal variation, 1901-81
- 3.11 Percentage distribution of urban population by size-class of cities of urban agglomeration, 1901-81
- 3.12 Masculinity proportion and sex ratio-India, 1901-81
- 3.13 Percentage distribution of male and female population by 5-year age-group-India, 1971 and 1981
- 3.14 Percentage distribution of total population by broad age-group index of aging and dependancy ratio-India, 1901-81
- 3.15 Estimated crude birth rates-India, 1901-81
- 3.16 Average number of children born alive per couple with the age of wife above 47 years by educational level of husband/wife (urban areas only)
- 3.17 Crude death rates-India, 1901-10 to 1971-80
- 3.18 Expectation of life at birth-India, 1901-10 to 1971-80
- 3.19 Infant mortality rates by sex and rural-urban residence-All India, 1972-83
- 3.20 Childhood mortality by age and sex, 1941-51 to 1961-71
- 3.21 The ten major causes of death in infants and children (1-5 years)
- 3.22 Percent distribution of internal migrants by sex-India, 1961, 1971 and 1981
- 3.23 Projected population of India, 1981-2001

- 3.24 Percentage distribution of Indian population by age and sex in 1981-2000 under alternative assumptions of population growth
- 3.25 Budget outlay and actual expenditure on family planning in India, 1951-56 to 1985-90
- 5.1 Sex-ratio in India since 1901
- 5.2 Sex ratio in states and union territories in India, 1981
- 5.3 Percentage of death by causes related to child birth and pregnancies (maternal), 1976-83
- 5.4 Literacy (percentage of literates) in India, 1901-81
- 5.6 Enrolment ratio-elementary classes, 1984-85
- 5.7 Crude work participation rate, 1984-85
- 5.8 Age-specific worker participation rate, 1971 and 1981
- 6.1 Water use of major activities in India, 1974-2025
- 6.2 Status of disposal of domestic waste water
- 6.3 Estimated reserves of some important mineral resources in India
- 6.4 Infrastructural achievements in different plans
- 7.2 Birth rate, death rate and natural growth rate in India, 1901-86
- 7.3 Plan outlay and expenditure on health and family welfare in different five year plans
- 7.4 Major causes of high IMR in India
- 7.5 Maternal mortality in India, 1976-80
- 7.6 Incidence of cardio-vascular disease in India
- 7.7 Cancer prevalence rates by sex-reater Bombay, 1964-67
- 7.8 Goals for health and family welfare programmes
- 8.1 Evaluation of nutrition programmes
- 9.1 Some physical changes during adolescence
- 9.2 Performance in universalisation of primary education (enrolments), 1978 and 1986 regional profile

LIST OF FIGURES

- 1.1 Interrelations among factors affecting quality of life
- 3.1 Age-sex pyramids - India (1981), Philippines (1980), Sweden (1981), and United States (1981)
- 7.1 Birth, death and natural growth rate in India, 1981-86
- 7.2 Consequences of Population Growth
- 7.3 Percentage of death by major causes-rural India
- 7.4 Infant mortality rate-India, 1981-86
- 7.5 Percentage distribution of sepecific causes of diseases in infants-India, 1986
- 7.6 Percentage distribution of death by causes related to child birth and pregnancy (maternal) India, 1986
- 8.1 Vicious circle of child mortality
- 10.1 Male reproductive system
- 10.2 Female reproductive system

ABOUT THE SOURCE BOOK

The availability of a comprehensive national source book is of crucial importance in any endeavour to introduce population education in the existing education system through a well-designed educational programme. This is so because ever since the emergence of population education as an innovative curricular area during the 1970s, the inadequacy of its knowledge base i.e., the basic core content, has been posing problems for educational activities aimed at the integration of population education into all aspects of education processes. And the crystallisation of the knowledge base has not been an easy task primarily because of the complex nature of population education.

One of the special features of population education as an educational endeavour is that it lays more emphasis on objectives relating to affective domain, necessitating the selection of such contents as have a potentiality to initiate among the learners the processes of attitude transformation and value orientation towards population issues. The content of population education has to be derived from several academic disciplines, such as, demography, sociology, geography, economics, psychology, biology, ecology, medicine and others; and in many instances these contents need specific orientation in order to attain specific instructional objectives. The absence of adequate experimentation before the diffusion of population education and significant cultural and development policy variations from country to country and from region to region have made the task of the formulation of the knowledge base of population education very complex and difficult.

The Need

Preparation of a source book at the early stages of programme development is therefore generally considered essential in order to make available to the curriculum developers the overall contents of population education. It was with this end in view that attempts were made in India during the early 1970s to develop a national source book on population education in collaboration with the Unesco Regional Office Bangkok. But the project could not be completed because of circumstantial constraints emanating from the urgency to perform many tasks relating to project implementation simultaneously. Now that the population education programme in India is fairly well advanced and is gradually maturing as a national educational effort, the need of a national source book on population education is felt more intensely.

When the potentiality of population education as an intervention strategy to help the nation attain its demographic and developmental goals was realised in the

National Seminar on Population Education held in August 1969, efforts were made in the National Council of Educational Research and Training (NCERT) to formulate the knowledge base of population education by preparing a number of curricular and instructional materials, readings and training materials. These materials provided a functional backdrop for the launching of the National Population Education Project (NPEP) in 1980, aimed at institutionalising population education in the existing school education and non-formal education.

Since then efforts have been afoot to make population education an integral part of the on-going syllabi and textbooks, teacher training and other educational processes. A considerably large quantity of varied kinds of materials have been developed at both the national and the state levels, a large number of teachers and other functionaries have been oriented, a variety of co-curricular activities have been organised right from the school level to the national level at regular intervals, and some significant evaluation activities have also been conducted. The National Policy on Education, 1986 and the Approach Paper of the Eighth Five Year Plan 1990 have extended effective institutional support to the efforts being made under NPEP. This has facilitated the incorporation of population education elements in the syllabi and textbooks prepared at the national level and also in the majority of the states. These have also been integrated in the elementary teacher training courses of a number of states and to some extent in the secondary teacher training courses.

Population education is thus proceeding towards the goal of institutionalisation, as its concerns are now reflected not only in the national population policy but also in the national education policy and its elements are increasingly integrated into various aspects of school education and teacher education. But it has still to travel a long way to attain its ultimate goal in full measure. Moreover, institutionalisation of an innovation does not take place only by the incorporation of its concerns into various components of existing education system. What is even more important, especially in the case of an innovation like population education is the full understanding and appreciation, on the part of all concerned, of its nature, objectives, content and methodology and the acquisition of professional skills and competencies in its transmission to different kinds of clientele - students, teachers and other educational functionaries. It is, therefore, essential to make available to the various usergroups the knowledge base through a national source book.

Moreover, since population education is a highly complex area, imbued with cultural sensitivities and regional variations, it has been subjected to varied conceptualisations. Even now the debate continues regarding its nature vis-a-vis family life education, sex education and family planning. With proliferation of literature on population education and other related areas brought out at

international, national and state levels by various organizations and agencies, the non-specialist functionaries find it difficult to comprehend population education in proper perspective. They are confronted with a variety of concepts, principles, laws and theories regarding population dynamics, socio-economic development, cultural settings, environment, health and nutrition and family life concerns. It is, therefore, needed to crystallise these issues and present them before different target audiences in a form that will be useful to them.

The Need for a source book has also been felt for consolidating the experiences of varied nature, gained during the intensive working in this area for the last two decades at the international, national and state levels. The flurry of activities have generated a number of useful experiences in the areas of conceptualisation of population education, crystallisation of its intellectual base by deriving contents from several academic disciplines, preparation of various kinds of materials, integration of its elements into the content and process of education, adoption of different strategies for orientation of teachers and other functionaries, organization of co-curricular activities, monitoring, conducting evaluation and research activities and information networking. These experiences, presented in an organised form through a source book would indicate *the state-of-the-art* of population education and greatly help different target groups in contributing to the development of this area in future.

Basic Purposes of the Source Book :

The present publication, *Population Education: A National Source Book*, is addressed to meet the above mentioned needs. It has been designed to serve as a source of information on both the *content* and *methodology* of population education. It is expected to serve the following three basic purposes:

First of all the Source Book aims at making the *knowledge base* available to different target groups who can extract appropriate material for relevant learning experiences. The knowledge base no doubt emphasises the cognitive domain, but in view of the importance of non-cognitive objectives in population education, it also incorporates elements relating to attitudes, values, processes, skills and behaviours. In this sense the Source Book also aims to develop the *beyond knowledge base* from which the curriculum developers can select non-cognitive aspects of the content of the curriculum. In order to be functional, the Source Book tends to be both *comprehensive* as well as *selective*. While it tries to include all relevant quantitative and qualitative information regarding different core areas of population education, it does it only to the desirable depth. Instead of compiling various kinds of data and information, it brings these together to be perceived in totality, so that the users are

able to comprehend the intellectual scope as well as multi-disciplinary and interdisciplinary nature of population education.

The second major purpose of the Source Book is to present a plethora of information relating to pedagogical aspects of population education. It aims at exposing the educational functionaries to the processes, approaches and strategies involved in the imparting of population education, so that they can organise learning experiences and evaluate them with professional skills and competence.

The third purpose is to galvanise the process of consolidation of experiences of population education at least in the area of school education. The Source Book contains such a comprehensive information in respect of various dimensions of population education as would not only help in comprehending to serve the state-of-the-art of population education but also continue as a guide to all future endeavours for bringing improvements in the content and process of school education.

Primary Audiences of the Source Book

The Source Book has been prepared to meet the needs that have emerged during the implementation of NPEP in the school education and non-formal education. The primary audience of this Source Book, therefore, are teacher educators, teachers, curriculum development specialists, all the functionaries engaged in development of materials, key and resource persons organising orientation programmes and educational supervisors and administrators engaged in the implementation of population education programme. It is also primarily addressed to researchers who conduct evaluation and research studies in the area of population education. Some pupil teachers and students of secondary and senior secondary stages may also find this book useful. However, this publication can also be useful to various functionaries of population education programme in adult education, university education and health and family welfare sectors as well as those of the voluntary agencies engaged in family welfare activities.

Organisation of the Source Book

The Source Book has two volumes. The first volume contains the knowledge base of population education and the second volume deals with its pedagogical aspects, processes and strategies. Both the volumes are so organised that they complement each other when used together, but could be independent publications, each complete in itself, if used separately.

The present volume consists of eleven chapters grouped into seven sections. While the first section delineates different aspects of population education in international and national perspectives, the remaining six sections are devoted to the major content areas of population education, drawn from related academic

disciplines. Though the contents have been derived from different disciplines, an attempt has been made in each chapter to get away from the respective subject treatment and to focus on the interrelationships between related contents and population issues. Moreover, the volume contains appendices and the bibliography, that have direct bearing on the knowledge base of population education.

The first section is devoted to the status of population education, as it has emerged as an educational innovation. The first chapter presents an overview of population education in global perspective. The author outlines the backdrop, in which the need for population education was realised and proceeds further to discuss the process of evolution of the concept of population education. He also mentions some critical issues and trends in population education.

The authors of the second chapter discuss population education in Indian perspective. In the background of Indian population situation and the consequent policy interventions, they explicate the nature of population education, its meaning and the conceptual framework. The chapter also presents a brief discussion on various dimensions of national population education project of India and its future directions.

The second section is devoted to a very comprehensive treatment of population dynamics. The authors explain population situation in historical perspective and discuss various components of population change. They have defined various demographic concepts that could be relevant for the target audience of the Source Book. The chapter also includes a brief delineation of population policy and programmes in India.

The third section deals with issues relating to the interaction between population and development. The first of its two chapters deals with population and development in post-independence India. The author discusses the interrelationship between population trends and various development variables. The second chapter is exclusively devoted to the issues on women and development. The chapter succinctly brings out the critical issues in respect of the status of women in India and tries to co-relate it with different pro-natal factors.

The fourth section explicates the interrelationship between population, environment and resources. Initiating the discussion with the status of environment vis-a-vis population explosion, the author brings out critical issues in relation to the demographic trends and their impact on the national goal of attaining sustainable development.

The fifth section of the Source Book contains two chapters. The first chapter deals with issues concerned with population and health. The authors of this chapter initiate the discussion by defining health, and present the health profile of India

covering various significant aspects of health and health services and national health policies and programmes. The second chapter is devoted to population and nutrition. The author discusses some specific factors affecting food intake, nutritional status and gender difference in food intake. He also explains some common deficiency diseases in relation to family size and welfare of its members, and outlines major national nutrition programmes.

The first chapter of the sixth section deals with family life education. While underscoring the need to impart such education, the author explicates various issues and problems relating to adolescence—physical changes, emotional aspirations and conflicts, sexual drive and its related problems, and the need of counselling the adolescents. In the second chapter on human reproduction, the author explains various facets of the physiology of human reproduction, fertility regulation and family planning methods. He also discusses different types of sexually transmitted diseases.

The last section is devoted to population change and education in India. The author initiates discussion on education in India in the context of population change and quality of life. He discusses various aspects of education policy, such as universalisation of primary education and the education of the socially disadvantaged groups in the perspective of population change in the country. He also discusses implications of population change in the context of the goal of education for all in A.D. 2000.

This volume contains five appendices - demographic glossary, statistics on population and development, information sheet on environment, research findings on population and nutrition and information sheets on the growing up, and a comprehensive bibliography on population education, population dynamics, population and development, population and environment, population, health and nutrition, family life, and population and education in India.

The second volume is devoted to the processes and strategies of population education. It contains two main sections: the first on the conceptual framework of population education and second on the methods and strategies.

No Source Book of this type could possibly be complete, and this volume also does not pretend to be comprehensive in its inclusion of all necessary information. What it does seek to do is to lay a foundation of the knowledge base of population education as it has emerged during the last decade of its experimentation. It also points to sources that can provide detailed treatment of various dimensions of the inter-relationship between population, development, resources, environment and quality of life.

SECTION - I
POPULATION EDUCATION

An Overview of Population Education

R.C. SHARMA

On 11, July 1987, the world population touched the five billion mark. The world population had been almost stationary at ten million during hundreds and thousands of years of the old stone age. Sometime between 8,000 B.C. and 6,000 B.C. man learnt to grow food and so could support a large population. As a result, human population increased to half a billion by A.D. 1650 i.e. an increase by about fifty times in 7,000 to 9,000 years. In the next 200 years, by 1850, the population doubled and reached its first billion point. But it took about only 100 years to add another billion, and about 45 years to double the population to 4 billion in 1975. And it has taken just 12 years to reach the 5 billion mark in 1987. At the present rate of growth, we will add another billion in the next twelve years. The world population will be over 6 billion by the year 2000 with almost ninety per cent of growth taking place in the developing countries.

According to the 1981 census the population of India was 683.81 million with an annual rate of growth of 2.21 per cent. The United Nations estimates show that the population of India in mid 1988 was 818.78 million and will increase to 1,042.53 million by the end of this century and to 1,455.57 million in 2025¹. Today, India ranks second in the world, its total population size being second to China. Her population will be almost equal to China in the next 35 years or so. With only 2.42 per cent of the world's land area, India has to support about 15 per cent of the world's population. In comparison to the United States, India is about two-fifth in area but has about two-and-a-half times its population.

What are the implications of this unprecedented increase in population on development and improvement of quality of life of the people?

THE POPULATION DEBATE

For the past over 200 years, scholars and policy-makers have been debating the question of the relationship between population and development. Controversies have raged about the future of the world because of increasing population and depleting resources. Perhaps the best known controversy is that between the doomsayers' who see the concurrent pressures of population growth, increased demand for resources and environmental degradation as serious threats to the

earth's capacity to sustain human population; and the 'cornocopians' who see opportunities rather than problems, who predict with equanimity that human ingenuity, technological advances and efficient distribution systems will usher in a golden tomorrow. There are others who combine different shades of arguments between the two extreme view points.

One extreme view is held by some people like Ehrlich and Fremlin. Ehrlich in his book, *The Population Bomb* warns that if growth continues at the present rate for 900 years, there would be some sixty million billion people. This would be about 100 persons for each square yard of the earth's surface, land and sea. The British physicist, J.H. Fremlin, guessed that such a multitude might be housed in a continuous 2000 storey building covering our entire planet. The space which would be left, after allowing for equipment etc., would be 3 or 4 yards of floor space for each person. Perhaps, he could travel only within a circle of a few hundred yard radius on any floor. However, such a level of population will never come because the biological, physical and social limiting factors will start applying long before the frightening stage, as envisaged by Ehrlich and Fremlin, is reached. 'Growth whether of size or number, is a determinate process, self-limiting. Otherwise, it exceeds the capacity of organization and becomes pathological'².

Julian Simon offers a more optimistic picture of the future of the world. According to him 'there is no physical or economic reason why human resourcefulness and enterprise cannot forever continue to respond to impending shortages and existing problems with new expedients that after an adjustment period, leave us better off than before the problem arose. Adding more people will cause us much more problems, but at the same time there will be more people to solve these problems and leave us with the bonus of lower costs and less scarcity in the long run. The bonus applies to such desirable resources as better health, more wilderness, cheaper energy, and a cleaner environment'.³

The relationship between population and development was one of the issues on which views were most sharply divided at the Bucharest World Population Conference in 1974. The western developed countries argued that population explosion seriously retarded development and that measures to reduce birth rates and excess population growth rates would improve the quality of life of individuals and help social and economic aspects of the development process. Many (but not all) of the developing countries agreed with this view, but emphasized that population was not the sole or basic problem. Others were insistent that only rapid development and a restructuring of the international economic system could produce the social conditions necessary for lower birth rate.

Population, Consumption Styles and Development

The increasing affluence with its characteristic consumption-based life-style is equally responsible for the problems of depleting resources and unequal development among countries. Since 1950 the annual growth in global demand for goods and services has been about 4 per cent. The world's population has been growing at a rate of about 2 per cent per annum. The remaining 2 per cent has been absorbed by the rising rate of consumption.

The race among the countries to achieve a higher rate of economic growth is a significant dimension of the 'resource crisis' problem. Economic growth means more consumption of resources. For example, the annual GNP of western Europe in the late 1960s was about 4.4 per cent which was associated with a 7 per cent annual growth in oil consumption. Japan's annual growth of about 12.4 per cent in that period was accompanied by a 17.1 per cent growth in oil consumption. The same situation prevails with regard to the consumption of other resources.

Garrett Hardin's analysis of the 'Tragedy of the Commons' has become a classic statement to explain the over-utilization of resources. Using the analogy of the common pasture land of historic English villages, he argues that the carrying capacity of such common resources will be exceeded when individuals act in an economically rational manner. Thus, to maximize immediate welfare, each herdsman places additional cows on the pasture, since the benefits (additional milk, beef, profits, etc.) accrue directly to him while the costs of additional grazing are shared with all other herdsmen. In short, the rational herdsman concludes that the only sensible course for him to pursue is to add another animal to his herd. But his is the conclusion reached by each and every rational herdsman sharing a commons. Therein lies the tragedy. Each man is locked into a system that compels him to increase his herd without limit—in a world that is limited. Ruin is the destination toward which all men rush, each pursuing his own interest in a society that believes in the freedom of the commons. Freedom in a commons brings ruin to all. In fact, 'Tragedy of the Commons' is analogous to a wide range of complex problems which we are facing today.

There is a great variation among countries in the consumption of different resources. In fact, there is what is called a 'Consumption Explosion' happening mainly in the developed countries. The developed countries with only about 25 per cent of the world's population consume about 75 per cent of the world's resources. The United States, with only 6 per cent of world's population, consumes about one-third of the resources. Davis⁴ compared consumption of resources by an average Indian and an average American. According to him the average Indian eats his daily

few cups of rice or perhaps wheat, draws his bucket of water from the communal well and sleeps in a mud hut. He burns cow dung to cook his rice and warm his feet. His contribution to the destruction of the land and resources is minimal.

An American, on the other hand, can be expected to destroy a piece of land on which he builds a home, garage and driveway. He will contribute his share to the 142 million tons of smoke and fumes, seven million junked cars, 20 million tonnes of paper, 48 billion cans and 26 billion bottles, which the overburdened environment must absorb each year.

In 'Indian equivalents', therefore, the population of the United States was about seven billion in 1984. And the rate of growth was even more alarming.

Another dimension to the problem of development has been identified by the Brandt Report. It points out that an enormous amount of resources is being diverted for the development of armaments which are being used and will be used for the destruction of human beings and earth. The Report says that the annual military bill is about 450 billion US dollars, while expenditure on development accounts for less than 5 per cent of this figure. It cites other examples such as the following:

1. The military expenditure of only half a day would suffice to finance the whole malaria eradication programme of the World Health Organization.
2. A modern tank costs about one million dollars; that amount could improve storage facilities for 100,000 tonnes of rice and thus save 4,000 tonnes or more annually: one person can live on just over a pound of rice a day. The same sum of money could provide 1,000 classrooms for 30,000 children.
3. For the price of one jet fighter (20 million dollars) one could set up about 40,000 village pharmacies.
4. One-half of one per cent of one year's world military expenditure would pay for all the farm equipment needed to increase food production and approach self-sufficiency, eliminating the food deficit of low-income countries by 1990.

In recent years, countries have diverted a significant proportion of their national resources to defence. This world's military expenditure crossed the trillion dollar mark (a million million) in 1985. Spending in 1984 was estimated to be about \$ 970 billion.

According to the latest assessment of the U.S. Government, Arms Control and Disarmament Agency (ACDA), NATO and Warsaw Pact countries account for nearly three-fourths of present global defence spending. The growth in real military spending by developed countries increased from an annual rate of under 2 per cent in the 1970s to over 4.5 per cent in 1982-84.

Contrary to this trend of growing military spending by advanced countries, growth in defence expenditure in developing countries slackened from a dramatic 12 per cent in 1972-75 to an estimated 2 per cent in 1982-84.

In 1982, ACDA estimated that the developed states spent \$57,000 per member of its armed forces—five times more than the average of \$ 10,500 spent on each member of the armed forces of developing countries⁶.

Some third world countries have also been dragged into the mad race of substantially boosting their armaments, sometimes to protect their legitimate or more understandable security interests, but sometimes also for prestige purposes and sometimes on being encouraged by arms-producing countries. Business has been rewarding for both old and new arms suppliers who have spread an incredible destructive capability over the globe. Many developing countries are spending a major portion of their income on defence as compared to other sectors such as health, education, social services etc. It is a terrible irony that the most dynamic and rapid transfer of highly sophisticated equipment and technology from rich to poor countries has been in the machinery of death.

From the foregoing discussion of the problems of increasing population, rising consumption and huge spending on armaments, the understanding of the relationship between population and development becomes highly complex. Unless the value judgement is made as to what a developed society is, it is difficult to determine which changes are part of the development process. Alternatives themselves range from differing political, ideological or social systems.

Some member states of the United Nations system expressed collective concern about the implications of population growth and distribution for development in a declaration, now known as the United Nations Declaration on Population, issued by the Secretary General of the United Nations on Human Rights Day, 10 December, 1966. The countries which sponsored the Declaration and subscribed their signatures to it consisted of three developed countries, Sweden, Finland and Yugoslavia, and nine developing countries, Columbia, India, Korea, Malaysia, Morocco, Nepal, Singapore, Tunisia and the United Arab Republic. There has been no looking back since then. The concern with population problems has become almost universal and a majority of the countries have added their signatures to this Declaration.

Although the relationship between population and development is complex and not yet completely understood, the Report of the State of World Population 1988 says: 'Increasing human demands are damaging the natural resource base—land, water and air—upon which all life depends. High fertility and rapid population

growth are contributing to the process. In developing countries, slower growth and more even distribution of population would help to take pressure off agricultural land, energy sources, vital watersheds and forest areas, giving time for governments, the private sector and the international community to evolve strategies for sustainable development. In the poorest areas, the "scissors effect" of poverty and increasing population is slicing away at their ability to sustain human life". Many poor countries with high population growth rates have, in fact, already discovered that they have to run very fast to stay in the same place.

NEED FOR POPULATION EDUCATION

Realizing the negative effect of rapid population growth on development, many developing countries have launched family planning programmes. The success of family planning programmes in some countries such as China, has been significant in terms of reducing the rate of population growth. However, in a majority of countries, including India, family planning programmes have not been so successful.

There are two main reasons *inter alia* for the hidden momentum of population growth in the developing countries. These are: (i) the socio-cultural and religious values of the people which influence their fertility behaviour, and (ii) the large young population of these countries. Population change is both a biological as well as a socio-cultural phenomenon. The whole process of reproduction leading to the birth of a child is biological. But the decisions behind the birth of a child and the size of family are governed by socio-cultural values, traditions and customs. For example, in most of the developing countries people place a high value on the birth of a son. Similarly, there are many other pro-natalist values which influence the fertility behaviour of the people. In general, socio-cultural values change sluggishly over time through a variety of factors; but one of the most important factors is education. Any coercion in changing the values of the people can backlash and foil all the efforts. There are a number of studies which show a direct relationship between education of the people and their fertility behaviour. For example, a study conducted in Thailand shows that the rural women with five or more years of education bore, on an average, just over half as many children as those with no schooling. Urban women with ten or more years of education bore less than 45 per cent as many children as their counterparts with no schooling⁸.

Similarly, the 1970 census data of the Republic of Korea shows that the average number of children born per woman among those who studied beyond secondary level was significantly lower (2.15) than among those who never attended school (5.21).

In her inaugural address at the First Conference of Asian Forum of Parliamentarians for Population and Development held at New Delhi from 17 to 20 February 1984, Mrs Indira Gandhi the then Prime Minister of India made a specific reference to the importance of education in inculcating attitudinal and behavioural changes in the people to accept family planning. This should be accompanied by organizational arrangements for contraceptive advice and medical services. She said:

Young people must be in the vanguard of the movement to restrict population growth and to promote sustained development. In schools and colleges and through non-formal education they must be made conscious of the dynamics of population growth and its implications for their own further well being and that of the nation. Properly planned population education programmes need to be introduced at various levels so that when young people marry, they are fully aware of their responsibility to themselves, to future generations and to society. Every occasion and festival, be it religious or otherwise, where people get together, affords excellent opportunity to reach out to them to explain the importance of these programmes.

In view of the potential of education in alleviating the problems arising from increasing population, many countries have launched population education programmes at different levels of education in both formal and non-formal sectors during the past decade or so.

HISTORICAL PERSPECTIVE

Population education has a relatively short history. The first attempt to voice the need for population education was made, perhaps, by Alva Myrdal in 1941. In her book *Nation and Family* she tried to convince the United States of America that a conscious population policy was essential to realize the social policy. She emphasized the role of education in the development of new population policy. She, of course, referred to such education as family education. Nothing significant happened with regard to the inclusion of population content in curricula for about two decades. The March 1962 issue of *Teachers College Record*, Columbia University, carried an article by Warren S. Thomson entitled, 'The Population Explosion' and another article 'Population-Gap in the Curriculum', by Philip M. Hauser. Both of these articles drew attention to the need to include population content in the school curriculum. In 1964, a project to prepare instructional materials related to population education was undertaken at Teachers College, Columbia University, under the leadership of Professor Sloan Wayland. The output

of this project were two documents entitled *Teaching Population Dynamics*, and *Critical Stages of Reproduction*. These were designed as proto-type materials for the pre-service training of secondary school teachers.

While some efforts were being made at the individual level for introducing population content in the curriculum, the United Nations, particularly UNESCO, took keen interest and initiative in this direction. The first Director-General of UNESCO, Sir Julian Huxley, in his Annual Report for 1948, emphasized that over-population could drastically affect the future civilization and its rate of advance. He was particularly concerned by the undernourishment of much of the world's population and with the problems of erosion and depletion of natural resources. Somehow or other, he wrote, 'population must be balanced against resources or civilization will perish'. He suggested that UNESCO's task must include educating the peoples of the world to realize the gravity of the problems involved.

UNESCO's General Conference declared in 1968 that the purpose of UNESCO's activities in the field of population should be to promote a better understanding of the serious responsibilities which population growth imposes on individuals, nations and the whole international community. In 1970, it authorized the Director-General to assist Member States, on request, in the elaboration of population and family planning policies; and in 1972 it recommended that the Director-General promote, by means of education and information, a clearer insight among the public into the nature, causes and consequences of demographic trends. The General Conference of UNESCO at its seventeenth session adopted resolution I.221 authorizing the Director-General to pursue and undertake activities designed *inter alia* for the promotion of population education.

The Workshop on Population and Family Education, sponsored by the UNESCO Regional Office for Education in Asia and held at Bangkok in September-October 1970, was a landmark in the history of population education. Educators from thirteen member states in Asia addressed themselves to the task of preparing a statement of objectives for population education, suggesting strategies for organizing programmes, outlining content for incorporation into school curricula in the social sciences and the natural sciences, and preparing a set of draft sample instructional materials in mathematics, science and social studies. A noteworthy outcome of the workshop was that in course of time several of the participants played key roles in developing population education programmes in their own countries.

In some countries, population education was instituted in response to the recommendation of the World Plan of Action, which stated that government should consider making provision in both the formal and non-formal educational

programmes for informing their people on the consequences of existing or alternative fertility behaviour for the well-being of the family, for the educational and psychological development of children and for the general welfare of society, so that an informed and responsible attitude to marriage and reproduction will be promoted¹⁰.

After initial resistance, the programme of population education picked up quite fast in the seventies. Five countries in Asia launched national programmes in population education after the 1970 Regional Workshop, with the financial support of the United Nations Fund for Population Activities (UNFPA) and technical assistance of UNESCO. By 1988 about twenty-five countries in Asia and the Pacific region had started national population education programmes.

India was, perhaps, the first country to have taken up the task of introducing population education. The Family Planning Association of India presented a memorandum to the Government of Maharashtra, urging that population education be introduced into the educational system of the state. During the same period a 'White Paper' on educational reconstruction was published by the Maharashtra Government in April 1988. The proposal was based on the firm conviction that one of the important ways in which the educational system can be made a 'powerful instrument of national development' was by providing a basic understanding of the dynamics of population growth and how did it affect the daily lives of the people and national welfare. The memorandum, however, made it clear that teaching about population control did not mean teaching young people about specific birth control methods and techniques, nor did it include sex education.

The first National Seminar on Population Education held in 1969 at Bombay set the pace for the introduction of population education into the school system. Since 1980, population education has been launched as a national programme under the banner of the National Population Education Programme (NPEP) by the Ministry of Education with the financial assistance of UNFPA and technical assistance of UNESCO. By 1988, 26 states and union territories were implementing the programme. The NPEP is executed by the NCERT and, during its first cycle, had sought to institutionalize population education in the formal school and teacher training systems. The programme was expanded to non-formal education, adult education and universities during the Seventh Five Year Plan (1986-90).

CONCEPTUALIZING POPULATION EDUCATION

Since the population education programme was initiated to supplement the family planning programme, it is sometimes misunderstood, both within and outside the

educational system, as another name for sex education and/or family planning education. This misconception has been one of the hurdles in starting population education programmes in some countries. Cultural variations have determined differences in the concept and scope of population education programmes in different geographical regions. In many countries in Asia and the Pacific region there is a cultural and religious resistance to include any kind of family planning or sex education component in school curricula. Sex education is still considered 'untouchable' in many countries in Asia, although some countries such as the Republic of Korea and the Philippines have included family planning and sexuality as a part of population education curriculum in schools. In Fiji, sex education is a major component of family- life education.

On the other hand, some Latin American countries place major emphasis on sex education because of the need felt for the individual to understand himself or herself as a sexual being, which is a prerequisite to the development of responsible parenthood. It should, however, be noted that in Latin America and to a lesser degree in Francophone Africa, the term sex education (and, sometimes, family education) is used to suggest a broader range of activities. There, 'sex education' may be the most suitable term for what has been called in Asia 'population education'.

Conceptualization of population education is rather a question of emphasis, rooted in complex cultural and historical differences. The situation is not expected to remain static. There are already signs of change in the concept and scope of population education in some countries. Although some countries do not openly accept any kind of sex education or family planning education in schools, they do realize the need for including some content related to these areas in the population education curriculum. A number of surveys recently conducted in some countries in Asia vouch to this change in the perception of and their acceptance to include sex education related contents in the framework of population education.

The concept and scope of population education also differs with target group. Although opinions may differ with regard to the nature and content of population education for the children, there is little difference of opinion so far as the population education programme for youth and adults is concerned. The information on sex and family life is of immediate relevance to this group.

Defining Population Education

Given the cultural diversities and different target groups, it may be difficult to give one definition of population education which can be universally accepted. Definitions also differ in the specific behavioural outcomes which they specify, such

as acceptance of a small family norm while others adopt a non-directive approach. The assertion that 'a small family is a happy family' is not universally true for there are many instances of bigger families being happy families. The pursuit of such an objective may have psychological implications for children who come from larger families.

In spite of the difficulties in the perception of population education, many individuals and many conferences have tried to give a definition of population education. Let us examine the following two definitions.

Population education is 'an educational programme which provides for a study of the population situation in the family, country, nation and world with the purpose of development in the students of rational and responsible attitude and behaviour towards that situation'¹¹.

Population education is 'an educational programme which helps learners to understand the inter-relationship of population dynamics and other factors of quality of life and to make informed and rational decisions with regard to population related behaviours with the purpose of improving the quality of life of himself, his family, community, nation and the world'¹².

The above two definitions will give an idea of the change in the thrust and nature of population education over the past decade. The first definition focuses on the development of attitudes and behaviours towards the population situation—the main objective being population control. The second definition aims at understanding the inter-relationship of various factors of quality of life and making rational decisions for its improvement. Population dynamics is one of the factors in the whole process of improvement of quality of life.

The concept of population education as stated in the second definition, according to which the main goal of population education is to improve the quality of life of the people at the micro- and macro-levels, can be represented as in Fig. 1.1

There are a variety of factors which affect the achievement of the desired quality of life as shown in Fig. 1.1. These include population dynamics, socio-political system, process of development, availability of resources and the existing levels of living of the people. It should be noted that population dynamics is *one of the factors* of quality of life which affects other factors and is in turn affected by them. This means that controlling population growth does not automatically ensure improvement in the quality of life of the people. There are some countries in Asia which illustrate this point. For example, the Republic of South Korea had a population growth of about 2 per cent during 1970s but achieved a very high rate of economic growth, about 10 per cent per annum during the past over a decade. On

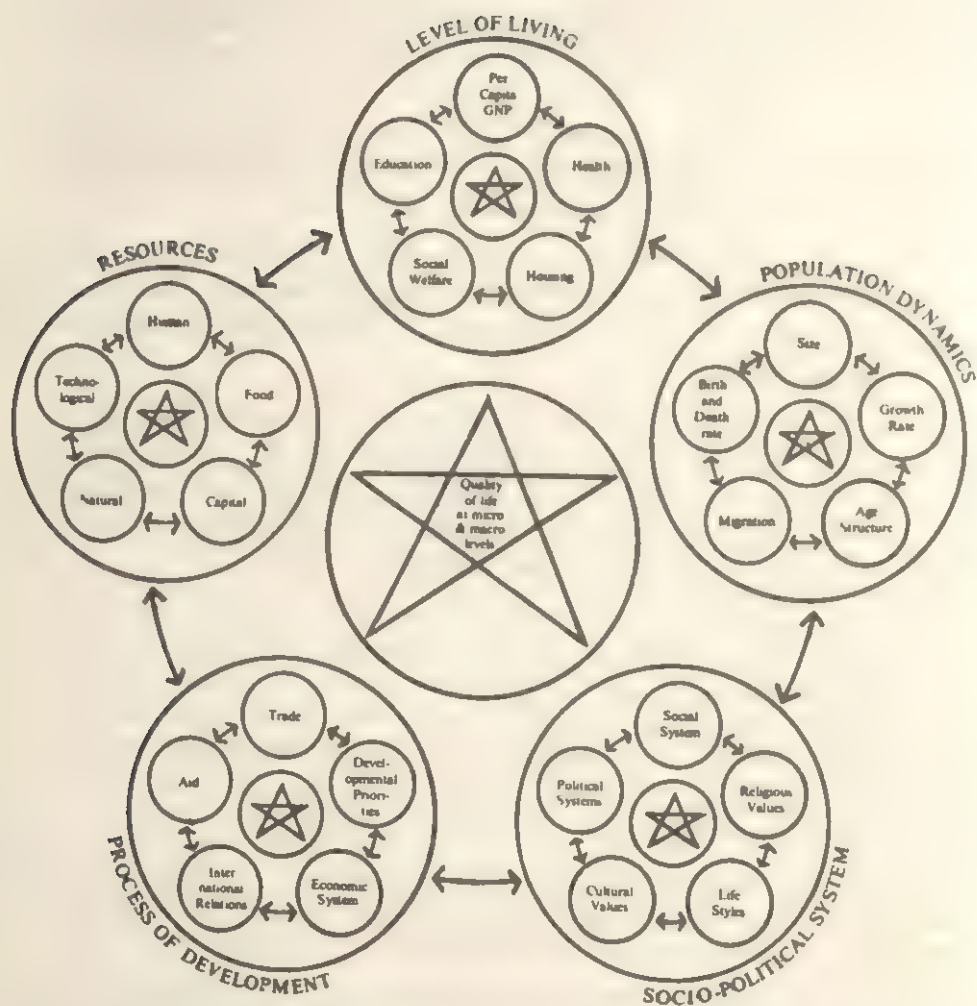


FIG. 1.1 INTERRELATIONS AMONG FACTORS AFFECTING QUALITY OF LIFE

Source: R.C. Sharma, *op. cit.*, p. 24.

the other hand, there were many countries with the same or lower rate of population growth but which showed a poor rate of economic growth. This, however, does not mean that a high rate of population increase in developing countries will not affect their development. In fact, countries with large populations and a high rate of population growth have to invest a greater share of their resources in meeting the basic demands of the increasing population. With the result, very little resources are left for improving the quality of life of the people.

The Concept of Quality of Life

Quality of life is a very complex concept and is perceived and interpreted differently by different people depending upon their socio-cultural and religious background, personal preferences and their philosophy of life. Perceived qualities of life depend on culture and internalized values and vary like other human requirements. For one society collective religious practices or communal life patterns may be primary, for others, individually oriented work or recreative pursuits may rank higher. Some societies prize tradition and continuity as important aspects of social quality whilst others place a high premium on innovation and modernity. Societies such as Japan may seek a balance of both tradition and modernity. Some Muslim countries have opted for a renaissance of its Islamic culture, whilst other countries have sought their qualitative goals in different ways. Developing nations may need strong assertion and acceptance of their cultural and political identity as a prerequisite for their qualitative development.

It would be impossible to set standards of quality for human beings in absolute terms. But one can suggest that people should have access to a range of options and alternatives which would allow them to select those particular qualities they desire. Various attempts have been made to define the quality of life, ranging from individual subjective evaluations to large-scale cross-national surveys. The quality of life is the sense of being pleased (happy) or satisfied with those life-elements that are most important to a person. In addition, quality is the sense of being pleased with what one has. Although satisfaction, happiness, or pleasure is the central element in this definition, it should not be seen as a momentary state of happiness or pleasure but rather a long-run sense of happiness. It is perhaps best expressed as a sense of fullness or completeness of life¹³. The quality of life involves the satisfaction of the emotional needs and social aspirations of the community or society as well as the society's ability to meet the basic needs of food, energy, space, housing, etc. by itself.

One of the criteria which can be applied to assess the standard of living or the quality of life may be the degree to which a society is stable or can live in harmony

with nature without endangering itself or the environment for an indefinite period of time. One could identify four principal conditions of a stable society, a society that to all intents and purposes can be sustained indefinitely while giving optimum satisfaction to its members. These are (i) minimum disruption of ecological processes; (ii) maximum conservation of material and energy or an economy of stock rather than flow; (iii) a population in which the recruitment equals the loss; and (iv) a social system in which the individual can enjoy, rather than be restricted by the first three conditions.

OBJECTIVES OF POPULATION EDUCATION

The population education programmes in different countries have been launched with different emphases depending upon political, social and cultural values of the society. Some countries are explicit about contributing to decreasing population growth rate. Other countries talk in general terms such as the impact of rapid population growth rate on quality of life. A couple of countries focus on family life education and at least two country projects are concerned with population distribution. These are briefly discussed below.

Decreasing the Rate of Population Growth

China, Thailand and Viet Nam are quite explicit in focussing on control limitation of the rate of population growth, as shown by their long-range objectives.

China: 'To contribute to the implementation of the overall Government Population Policy of reducing the rate of population growth to achieve zero population growth by the year 2000.'

Thailand: 'To help Thai people to make critical and rational decisions, pertaining to population and family planning matters. The programme hopes to contribute to the Government's effort to cut down the rapid rate of population increase'.

Viet Nam: 'To contribute to the realization of the population policy, i.e. to create awareness, understanding and support to efforts to reduce population growth rate and to redistribute the country's population'.

Family Life Education

The long range objectives of two out-of-school country projects in Afghanistan and Malaysia are centred on family-life education.

Afghanistan: 'To design and organize functional literacy programmes for rural and urban women related to family health, better family living and family guidance'.

Malaysia: 'To strengthen the family planning component of the family development programme by broadening its scope to family life education emphasizing, besides, family planning, the need for the improvement of quality of life of the individual, family and community, and in this way to contribute to the achievement of general objectives of the family development programme'.

Population Distribution

One country project, that of Viet Nam, included population redistribution in its statement of long-range objectives, as already stated in the preceding section.

In addition, although not explicitly made a part of the long range objectives, the population education programmes in Indonesia are concerned with population redistribution. The project authorities very often speak of uneven distribution of population as one among the serious population problems of the country, whereby 63.8 per cent of the total population are in Java and Madura, which constitute only 6.6 per cent of the total land area of the country. The long-range objective of the Sri Lanka project also made reference to 'the impact of population growth and distribution on the quality of life'.

Quality Of Life

By and large, the long-range objectives of many country projects are mainly concerned with (i) an understanding of the interrelationship of population change and socio-economic development, as well as aspects of quality of life; and (ii) an understanding of the population situation in the family, community, nation and the world, for the purpose of developing in students and out-of-school youth and adults rational and responsible attitudes and behaviour in response to population problems and issues deemed necessary to enhance the people's quality of life.

Although countries differ in respect of specific objectives of their population education programmes, the general objectives are more or less the same. The following general objectives could very well represent the nature of population education.

To enable learners to acquire the knowledge, skills, attitudes and values necessary (a) to understand and (b) to evaluate the prevailing population situation, the dynamic forces which have shaped it and the effect it will have on the present and

future welfare of themselves, their families, communities, societies, nations and the world; (c) to make conscious and informed decisions (based on their understanding and evaluation); and (d) to respond (either by an intention to act or by an action itself) to population situations and problems in a conscious and informed manner¹⁴.

In view of different socio-cultural backgrounds and population policies of the countries, the specific objectives of population education programmes are different. The specific objectives are also different for different grade levels and target groups. It will, therefore, not be worthwhile to list the specific objectives of population education. The following can be the major general objectives of population education:

1. To develop awareness and understanding about:
 - (a) population situation – national and world;
 - (b) basic demographic concepts and theories;
 - (c) processes of population change;
 - (d) determinants of population change;
 - (e) concept of quality of life in different socio-cultural settings;
 - (f) inter-relationship between population change and different aspects of quality of life at the micro-and macro-levels;
 - (g) consumption explosion and its implications on quality of life for others;
 - (h) human reproduction, eugenics and family welfare; and
 - (i) population policies, plans and programmes.
2. To develop the ability to assess the quality-of-life implications in relation to population change and consumption of resources, now and in the future, for oneself, one's community, nation and the world.
3. To develop rational attitudes, values and skills for taking responsible decisions and actions regarding population-related issues and improvement of quality of life.

SOME ISSUES AND TRENDS IN POPULATION EDUCATION

Population education being a value-laden area, one is bound to deal with many issues in implementing this programme. These issues arise because of the differences in the social, cultural, religious, economic and political systems and values of the people. Most of the values are so deep-rooted in the socio-cultural milieu of the

people that a concerted and continuous effort is needed to change them. During the last decade or so countries with population education programmes have developed a rich experience in dealing with these issues and as a result new trends in the implementation of population education programmes are emerging. Some of the issues and trends are discussed here.

Issues

Conceptual: The goals of most population education programmes generally refer to developing understanding, awareness, attitudes and responsible and informed decision-making and behaviour for improving the quality of life as the end-product of the education activity. Most goal statements are somewhat ambiguous and do not specify the nature of the behaviour to be achieved

In view of the controversial nature of population education, a number of issues keep coming up. These include issues like: What is population education? How does it differ from family planning and/or sex education? Does population education hold better prospects for success than family planning? What is the guarantee that the non-prescriptive approach in population education will be more effective than the prescriptive approach? What do we mean by quality of life? How far is it true that population education will help in improving the quality of life at the micro-and macro-levels?

Curriculum: Different approaches for developing curricula in population education have been used by different countries. Population education being of recent origin, has no clearly marked content boundaries. It is inter-disciplinary in nature and related to various subjects. The problem of an already overcrowded curriculum makes it difficult to establish population education as an independent subject in schools. The countries have, therefore, used the integration approach to include population education concepts in different subject areas. The curricula in population education in countries with population education programmes have been developed to suit the socio-cultural as well as educational needs of the countries. Although the overall goals of population education at the school level are more or less the same, there are differences in the immediate objectives, content areas, subjects of integration as well as modalities and approaches for materials development. For example, the curricula in population education of the Republic of Korea and the Philippines include contents relating to sexuality and family planning whereas other countries have avoided including them because of socio-cultural factors.

In many countries population education content has been integrated in as many as six or seven subjects. The result is that population education content gets so dispersed and diffused that it loses its focus and identity.

Some issues related to curriculum development in population education are: At what stage should population education be introduced? In view of the already heavy curriculum what approach should be used to introduce population education in the curriculum? What content should be included at different grade levels? What should be the minimum learning contents for different categories of audiences? How does one ensure integration of adequate population education content into curricula and textbooks?

Methodologies of Teaching: A variety of methodologies have been suggested for teaching population education but, keeping the nature of the subject in view, discovery-oriented or inquiry approach, values clarification and role-playing are recommended for teaching population education. The studies on teaching methodologies are inconclusive as to their relative effectiveness.

The following are some issues related to methodologies of teaching: Which are the effective methods in teaching population education? What is the possibility of using discovery or inquiry approach in teaching population education in view of the existing situations and constraints in schools? Isn't it a contradiction to expect teachers to use the discovery or problem-solving approach when they use traditional methods of teaching the subjects into which population education has been integrated?

Training: Training is one of the important components of all population education programmes. But it has also been the most difficult problem for the countries because of the enormous number of teachers and other persons who need to be trained within the financial and time constraints. The countries which have already launched national population education programmes have experimented with different strategies of training in addition to face-to-face training. Each strategy has its merits and demerits. There is as yet no empirical study conducted which can vouch for or recommend one or the other strategy. The countries have to decide themselves which strategy or combination of strategies could be effective in achieving the planned objectives of the training programmes as per their needs, available resources and constraints.

One is faced with the following issues in the training of personnel: What are the alternatives to face-to-face training to reach the maximum number of teachers and other personnel within a reasonable time, without sacrificing quality of training?

What formative and summative evaluation could be used to assess and ensure effectiveness of training programmes? What strategies of in-service training are cost-effective? What should be the duration of training for different categories of personnel in order to be effective? What approach (es) should be used for introducing population education in the pre-service training of teachers?

Evaluation and Research: This is one of the weak areas in most of the national population education programmes. Although most of the projects have some kind of in-built evaluation process of curriculum, materials and training programmes, there have been very few systematic and comprehensive evaluation studies on the impact of the programme on the target audiences. Only some programmes during the past three to four years have initiated comprehensive and longitudinal studies to evaluate the impact of the programme.

Population education deals not only with the cognitive domain but even more importantly with the affective domain i.e. with attitudes, appreciations and values which are not easy to assess. In the absence of any reliable tool of evaluation, it would be difficult to say whether the objectives of population education have been achieved or not. The problem of evaluation is further complicated by the fact that invariably population education content has been integrated into different subjects.

There seems to be a dearth of research in the substantive and methodological areas in population education. However, where there are researches, one wonders if they are being utilized as bases for programming different aspects of population education.

In the absence of systematic evaluation and research and in the light of the problems discussed, can we say the changes in population-related attitudes and values are due to population education programmes? To what extent would we be correct in attributing a reduction in the fertility rate in a community or country to its population education programme? How then do we justify the population education programme vis-a-vis the family planning programme? What then are the most appropriate ways of evaluating the impact of population education on the knowledge, attitudes and behaviour of different target audiences?

Operational: Two types of operational models are being used by different countries for implementing population education programmes. In some countries the population education projects are a part of the functions of Curriculum Development Centres. In others, they are separate projects under the Ministry of Education. These projects work in close collaboration with the curriculum development bodies and other concerned departments.

Both of these models have their merits and demerits. The first model is, however, favoured over the second model because of its administrative and operational merits, and because it is more successful in integrating population education content in different school subjects as well as in the in-service training of teachers.

Institutionalization: The ultimate aim of population education is its institutionalization in the education system of the country. This process of institutionalization involves the following:

- (a) Population education content becomes an integral part of the curriculum and textbooks, either as a separate subject or as integrated into existing subjects.
- (b) Population education is incorporated as one of the areas of study in the pre-service teacher training institutions.
- (c) Questions on population education are included in the public examinations.
- (d) Population education is also introduced at the tertiary level of education as well as in non-formal and adult education programmes.

A close look at population education programmes in Asia and the Pacific region reveals that, although, some of these national programmes are a decade old, they have a long way to go before it can be said that population education is fully institutionalized in their education systems. Most of them are still passing through a transition period. This is because of the number of issues and problems of curriculum, integration into textbooks, training of teachers and other personnel, incorporation of population education in training institutions, financial constraints, etc.

Trends

The following trends have emerged during the past decade :

1. Population education is considered by most countries to be an integral part of their national development plans and education policies.
2. Although virtually all population education programmes espouse an open-ended, non-prescriptive approach in their goals and objectives, the content as well as approach is, often implicitly and sometimes explicitly, more directed towards the specific goal of promoting a small family norm. The funding agencies also want to see the effect of population education programmes on the reproductive behaviour of the target audience. This is more true for the out-of-school youth and adults.
3. Population education is considered relevant, not only by the countries with large populations, but also by countries with small populations with high rates of population growth.

4. Although population education is being introduced at all levels of school education, priority is being given to the middle and secondary levels.
5. The scope and content is being broadened to include concepts relating to sex education, family life education, responsible parenthood, adolescent fertility, delayed marriage and population related beliefs and values.
6. A smaller number of subjects, two or three, is selected for integrating population education concepts instead of five or more subjects.
7. In addition to integrating population education into the existing curriculum, a separate elective/required course is also being offered at the secondary level in some countries.
8. Some efforts are being made to utilize research studies on students' and teachers' knowledge, attitudes, and values concerning population matters for preparing curriculum and instructional materials.
9. Population education is offered as separate elective/required courses at teachers training colleges in some countries. It is also being offered as one of the specializations at the post graduate level by the Faculties of Education.
10. The need and importance of population education is being increasingly recognized by the universities and colleges and it is, therefore, being offered as an interdisciplinary elective or required course and, or in the form of extension lectures for the undergraduate students.
11. A variety of innovative strategies for the in-service training of teachers is being used, such as peer training, mobile training, self-instructional training, distance training etc., in addition to the traditional face-to-face training.
12. Effective methodologies of teaching, such as discovery or inquiry, role playing, simulation, games, etc., are being increasingly recognized and given serious trials.
13. In order to effectively monitor and co-ordinate the programme, co-ordination or steering committees in population education have been set up at the national, provincial and district levels in many countries.
14. Questions on population education are being included in the public examinations.
15. Longitudinal studies are being undertaken as a part of the programme in order to evaluate the impact of the programme on the target audience.

S.C.E.K r, West Bengal

Date...18...7...92...

Lec No...5186...

REFERENCES

1. *United Nations World Population Chart, 1988.*
2. Robert B. Frank, "The Biologist, the Psychologist, and the Environmental Crisis," *Bio Science*, XXI, 5 March 1, 1971, p. 221.
3. Quoted from *Populi*, Vol. 9, No. 3, 1982.
4. Wayne H. Davis, "Overpopulated Amercia: Our affluence rests on a crumbling foundations," in Parket. G. Marden, ed., *Population, environment, and quality of life*, New York, AMS Press, 1975, pp. 15-16.
5. An Indian 'equivalent' is defined as the average number of Indian citizens required to have the same detrimental effect on the land's ability to support human life as would the average number of Amercians, which is equal to 25.
6. *The Times of India*, 23 December, 1984.
7. Nafis Sadik, *State of the World 1988*, UNFPA, New York, 1988.
8. John Knodel and Visid Prachuabmoh, "The fertility of Thai women," in ESCAP, *Population of Thailand*, Bangkok, 1976, p. 76.
9. Report of the Director-General on the activities of the Organization in 1948, *UNESCO*, Paris, 1948.
10. *World Population Plan of Action*, United Nations, Bucharest, 1974.
11. Unesco, *Population and Family Education: Report of an Asian Regional Workshop*, Bangkok, UNESCO, 1971, p. 13.
12. R.C. Sharma, *Population, Resources, Environment and Quality of Life*, op. cit. p. 25.
13. UNESCO, *First Meeting of experts on indicators of the quality of life and environmental quality*, 6-9 December, 1976: Final Report, Paris, 1976.
14. Unesco, *Population Education: A contemporary concern*, Educational Studies Document No. 28, Paris, UNESCO, 1978, p. 36.

SELECTED REFERENCES

- Brandt, Willy, *North-South : A Programme for Survival : Report of the Independent Commission on International Development Issues*, MIT Press, Cambridge, Man. 1980.
- Cole, J.P., *The Development Gap*, New York, John Wiley & Sons, 1981.
- Gupte, Pranay, *The Crowded Earth*, New York, W.W. Norton and Company, 1984.
- Harrison, Paul, *Inside the Third World : The Anatomy of Poverty*, Sussex, The Harvester Press, 1980.
- Lester, R. Brown and Pamela Shaw, *Six Steps to a Sustainable Society*, Washington, D.C., World Watch Institute, 1983.
- Mitra, Asok, *India's Population : Aspects of Quality and Control*, New Delhi, Abhinav Publications, 1978.
- Parakh, B.S., *Population Education—Inception to Institutionalization*, New Delhi, NCERT, 1985.
- Sadik, Nafis, *The State of World Population 1988*, New York, UNFPA, 1988.
- Seshadri, C. and U.S. Madhyastha (eds.), *Population Education—A Manual for Teacher Educators*, Mysore, RCE, 1984.
- Sharma R.C., *Population, Resources, Environment and Quality of Life—Handbook on Population Education*, Delhi, Dhanpat Rai & Sons, 1988.
- UNESCO, *Population Education Programme in Asia : What Research Says*, Bangkok UNESCO, 1983.
- UNESCO, *Population Education : A Contemporary Concern*, Educational Studies Document No. 28, Paris, UNESCO, 1978.
- UNESCO, *Multimedia Package for the Training of Teachers in Population Education*, Bangkok, UNESCO, 1982.
- Council of Environmental Quality and the Department of State, *The Global 2000 Report to the President, Entering the Twenty-First Century*, Washington, D.C., 1981.
- The World Bank, *World Development Report*, 1984.

Population Education : The Indian Perspective

B.S. PARAKH & J.L. PANDEY

POPULATION SITUATION

The World Watch Institute in its latest report, *State of the World 1990*, has estimated that the population of India could "double or triple" in the next four decades, despite its intensive family planning programmes. It bases its analysis on the projection that world population in 2030 would be about eight billion. Notwithstanding certain limitations of such projections, the population situation in India, consequent upon the rapid increase in population, has been a matter of concern. The *Population Card*¹ indicates almost precisely that 33.5 people are added to the Indian population every minute whereas Indonesia adds only 5 people to its population and Japan 1. Even the People's Republic of China is adding only 30. Obviously, India's contribution to the world population which increases by about 173 every minute, is the largest. This trend of rapid growth of Indian population has implications not only in global perspective but also, and perhaps in more serious proportion, for the Indian nation. Whereas the country is 'striving to fulfil the basic needs to improve the quality of life' of its people, the evergrowing number has been generating 'unprecedented demands for more services in terms of food, clothing, housing, education, health and employment as well as environmental protection'².

There was a different trend of population growth in India before 1921, the year which represents 'a great divide' in the demographic history of the country. During 1881-1921, the Indian population had actually declined twice and until 1951 registered only a moderate rate of growth. Indeed in the decade of 1911-21 influenza took a toll of nearly 20 million human lives. Other epidemics had their own share. In 1943 as many as three million people in a few districts of Bengal starved to death in the great famine. This period of relative stability of population was therefore different from the demographic stability achieved by the industrialized and developed nations of the West. It was unhealthy and in fact was an index of poverty, illiteracy, poor health status and governmental irresponsibility. Since both the birth rate and the death rate were high and the average annual growth rate was about one per cent or even lower, India might be said to have been in 'the first stage of demographic transition' until 1941-51.

During the next decade of 1951-61 the death rate began to fall rapidly and the birth rate remained high or registered a slow decline, resulting in a sharp increase of average annual growth rate. Thus India entered into 'the second stage of demographic transition' after 1941-51. Since then every census report at a regular interval of ten years has been reflecting a disturbing demographic scenario. 'The 1981 census revealed that the annual growth rate had levelled off at just over 2 per cent during 1970s after rising during the 1950s and 1960s as death rates fell faster than the birth rates'³. This situation suggests that India has remained in 'the second stage of demographic transition' for over four decades, whereas countries like South Korea, the People's Republic of China, Indonesia and Thailand moved to 'the third stage' quickly. It is in this context that a question is posed: Does this mean that India has got into the demographic trap? Social scientists become apprehensive, because if India gets trapped for too long in 'the second stage', it may lead to serious consequences in respect of development, resources, environment and quality of life of the people.

Policy Intervention : Population and Development Policy

The realization of the adverse impact of unplanned population growth on the development process began quite early during the pre-independence period in India. Intellectuals, social reformers, political leaders and the Indian National Congress had expressed their concern regarding rapid growth of Indian population. In its post-independence period, it earned the singularity of being the first nation in the world to have adopted an official population policy during early 1950s. Since then a multi-pronged strategy has been adopted to attain the envisaged demographic goals and the family planning programme has been adopting increasingly effective approaches from time to time, i.e. from a 'clinical' approach to a 'community extension' approach and then to an, 'integrated development' approach coupled with 'incentives and disincentives'. With a more comprehensive perception of the problem, the family planning programme was renamed as the family welfare programme. In the wake of the review of this programme during February 1990, the Government of India was considering to introduce a series of incentives and disincentives to promote the small family norm⁴.

Population and development are closely interrelated and embrace a number of complex factors. 'In our interdependent world, it is not possible nor practicable to attempt to solve problems in isolation. Thus, matters of population must be seen in conjunction with many other factors—including health, education, employment, food supplies, housing and environment'⁶. It is in this context that in India the

concern for population planning permeates all government policies and programmes related to health, environment, energy, agriculture, food, urban and rural development, housing, etc. Success on population front is considered crucial for securing national development goals.

Demographic Goals

India has set up certain demographic goals for reaching the stage of population stabilization. A document of the Union Ministry of Health and Family Welfare stated:

The long-term goal is to reach zero population growth rate by 2050 A.D. with an estimated population around 1300 million. The medium-term goal is to reach Net Reproduction Rate of Unity (NRR : 1) by 2000 A.D. with a birth rate of 21, death rate of 9 and infant mortality rate below 60⁷.

In order to realize the target of a 'net reproduction rate of unity', the replacement level of fertility is to be brought down to about 2.3 births per woman from the current level of about 4.3 births per woman. This would be possible only when about 62 per cent couples in the reproductive age group are effectively protected against pregnancy⁸ by using the methods of modern or natural contraception. Realizing the magnitude of the problem, there are now indications that India may achieve the goal of NRR of unity only somewhere between 2006 and 2011.

Educational Intervention

In the course of the search for a more effective and innovative alternative approach, India was among the first few nations of the world, which realised as early as the 1960s the potential of education in reinforcing the national endeavour directed towards attainment of demographic goals. In response to the need to 'catch them young', population education was accepted as an intervention strategy and formed one of the major strands of national population policy in 1976⁹. It was planned to introduce this educational innovation into the general education system, so that it could play the role of a catalytic agent for promoting the process of change in the understanding and value orientation of the younger generation towards population issues aimed at promoting the small family norm.

Education Policy, 1986

While concerted and sustained efforts have been made since 1980 to integrate

elements of population education into both formal and non-formal education systems, the adoption of the 'National Policy on Education 1986' has been the most significant development. The policy reflects the magnitude of the demographic situation and all the concerns related to the causes and consequences of rapid population growth. It categorically mentions that 'the growth of our population needs to be brought down significantly over the coming decades'¹⁰. It expresses this concern in the specific context of its humanist perception of the significance of each individual and the dignity of his identity. As the policy postulates: 'In the Indian way of thinking, a human being is a positive asset and a precious national resource which needs to be cherished, nurtured and developed with tenderness and care coupled with dynamism. Each individual's growth presents a different range of problems and requirements, at every stage — from the womb to the tomb'¹¹. In order to ensure appropriate opportunities for each individual to develop as a potential human resource, it is very much desirable to arrest the pace of population growth. The policy believes that education can play the role of a catalyst in this complex and dynamic process.

The policy document is so well seized of the issues related to the prevailing population situation that it encapsulates almost all critical concerns in its stipulations in respect of the national system of education. While identifying 'a common core' to be reflected in the national curricular frame-work, it includes all those issues, which are to be understood rationally so that positive attitude develops in each individual¹². These issues constitute more than half of the ten 'core curricular areas' mentioned in the Programme of Action¹³. These are: constitutional obligations, equality of sexes, protection of environment, removal of social barriers, observance of the small family norm and inculcation of scientific temper.

It is interesting to note that 'observance of small family norm' finds a place of importance as a core element in the education policy for the first time in the history of the nation. This value can be promoted only when a proper attitude is developed in respect of basic components of the family life, i.e. maternal and child care, status of women, removal of illiteracy, interrelationship among population, environment, development and quality of life and prevalent values and beliefs. 'Recognizing the holistic nature of child development, viz., nutrition, health and social, mental, physical, moral and emotional development,' the policy promises that 'Early Childhood Care and Education (ECCE) will receive high priority and be suitably integrated with the Integrated Child Development Services programmes, wherever possible'¹⁴. This stipulation has a direct bearing on the demographic goal of bringing down death rate in general and infant mortality rate in particular. Equally significant is the commitment that 'education will be used as an agent of basic

change in the status of women'¹⁵, on which greatly depends the hope of restricting the fertility rate. The policy has itself recognised that 'the largest single factor that could help achieve this (limiting population growth) is the spread of literacy and education among women'¹⁶. It states that 'the whole nation must pledge itself to the eradication of illiteracy, particularly in the 15-35 age group'¹⁷. The policy document simultaneously assures that 'the new thrust in elementary education will emphasise universal enrolment and universal retention of children upto 14 years of age...'¹⁸

The education policy aims at creating 'a consciousness of environment'¹⁹ developing 'in the child well defined abilities and values such as the spirit of inquiry, creativity, objectivity, the courage to question, and an aesthetic sensibility'²⁰ through science education, and eliminating 'obscurantism, religious fanaticism, violence, superstition and fatalism'²¹. These aims, if realized, may enable the learners to critically examine *inter alia* the pro-natal values and beliefs that militate against promotion of the small family norm.

It is abundantly evident from the exposition in the preceding pages that the *National Policy on Education 1986* is imbued with the demographic concerns of the nation and committed to reorient the education system so that it can help in the attainment of demographic goals. Even while making stipulations regarding the future perspectives, it states that 'the main task is to strengthen the base of the pyramid, which might come close to a billion people at the turn of the century. Equally, it is important to ensure that those at the top of the pyramid are among the best in the world'²². Never before has the education policy lent such unequivocal support to the national population policy. Its provisions in particular provided credibility and strength to the education activities being conducted with a view to institutionalising population education into the existing education system. Until the adoption of this policy in 1986, the population education was a component of national population policy; but since then it has become a truly educational programme drawing support from education policy.

Population Education : An Intervention Strategy

Population education in India like in several other countries, emerged out of the realisation of the potential of education and the critical role that it can play in the national endeavour directed towards ensuring a viable population situation that can make a positive contribution to the task of national development. The first step in this regard was taken by the Family Planning Association of India in 1968 when it sent 'a Memorandum to the Maharashtra State Government recommending that in the revision of their school curriculum (which happened to be going on then)

education in population dynamics should be made a part of school studies'²³. The proposal was made in the spirit of the *White Paper* on educational reconstruction brought out by the Government of Maharashtra in April 1968²⁴.

However, the idea of population education was crystallised in the National Seminar on Population Education organised in Bombay by the Union Ministry of Education and Youth Services in collaboration with the Union Ministry of Health and Family Planning in August 1969. It recommended that 'population education should be introduced into the curriculum of schools and colleges by including it in so far as it may be possible, in the areas of study now common in the educational curriculum such as Social Studies, Sciences, Health Education, Mathematics, Languages, etc'²⁵. The Seminar made an attempt to define population education in the context of Indian situation and deliberated comprehensively upon the tentative programme of action for its introduction into the education system in consultation with experts and social workers. But more importantly, it expressed the national consensus for making this educational intervention at the school stage of our education system.

Why Introduce Population Education at School Stage?

There are a number of plausible reasons for imparting population education to young children. Some of these are commonly recognised in most of the developing nations, though there are some that have specific relevance to the Indian situation. The following compelling reasons merit our attention:

- (i) Since about 42 per cent of the Indian population consists of children below the age of fifteen years and their number is swelling enormously because of the rapid population growth, their role will be crucial in shaping the population situation of the country in immediate future. At present as many as ten million out of this age-group are entering into parenthood every year²⁶. If they are made properly aware about critical dimensions of population phenomena, they can be expected to take informed and rational decisions regarding population issues.
- (ii) It is generally observed that 'the perception of population-related issues by an individual may vary from that desired by the community or defined by national policies. This so happens because the national policies in respect of population issues are formulated according to the needs and requirements of the well-defined national goals, whereas individuals...perceive the population phenomena in their own socio-cultural milieu shaped by the traditional norms

and value patterns. Unless a perceptible social change directed towards the attainment of national goals takes place, there cannot be commonality in the patterns of perception at individual, community and national levels. With a view to inducing such a social change, education can play a decisive role'²⁷.

- (iii) 'The purpose of education is to prepare the young for adult life. This requires both presenting relevant information and teaching analytical processes and skills that can be broadly applied. Since population affects all aspects of modern life, important population issues and methods for analysing population problems should be an integral part of in-school education'²⁸.
- (iv) Population issues are predominantly value laden. Individual decisions are invariably influenced by the value orientation of the person concerned. The attitude and value orientation of individuals are shaped by their socialisation process. Attitudes in particular are formed during the early age of a person. The intervention of population education at school stage can therefore prove very effective, as it would provide suitable setting for values clarification and development of scientific temper.
- (v) 'The whole business of family planning and reduction of the birth rate is not "once-for-all" affair, nor is it concerned only with the currently fertile population that is capable of adding the country's numbers. Even as eternal vigilance is the price we have to pay for liberty, similarly, family planning education and programmes have to be on a continuous basis It is here that population education becomes relevant as a motivational instrument that will inject these new entrants with the desire to adopt family planning as a way of life'²⁹.
- (vi) 'It is also obvious that population education must cover not only the college-going students but those who only go to schools, as majority of children grow into adulthood without having more than secondary and in many cases only primary education'³⁰.
- (vii) At times it is argued that since population related topics have always been in textbooks, particularly of social studies, economics, geography, biology or home economics, there is no need to introduce population education. However, the topics in the existing textbooks have generally been treated in a neutral manner, and invariably as facts to be memorized rather than to be treated as tools for sound decision-making. It is by conscious efforts through population education that the existing contents could be reoriented and reinforced in order to realize the desired objectives of population education.
- (viii) It is hoped that the integration of population education elements into the existing education system would encourage the children who would grow adult

while passing through the school stage, to play the role of opinion leaders in their respective communities. They may help in preparing a congenial atmosphere in the community for the realisation of national demographic and development goals.

- (ix) It is also expected that population education would eventually make the learners realise that although it is essential to believe in the dignity of the individual and freedom of choice, but it is equally important to dovetail the belief with the social good and national demands.

Meaning of Population Education

The considerations contained in the above exposition weighed a great deal in the acceptance of population education as an intervention strategy in India for attaining the national demographic goals. However, the first crucial task was to define population education and develop its conceptual framework with a scheme of contents that could be relevant to the Indian situation. When this task was initiated there was no model which could be adopted to suit the conditions prevailing in this country. Moreover, population education emerged as a region- and culture-bound concept. Since population education emerged in the back-drop of the family planning strategy being employed to limit the rate of population growth, there were a number of misgivings. However, some attempts at defining population education were made in the National Seminar on Population Education. It was regarded as 'a motivational force for creating right attitudes to family size and the need for family planning' and not a 'sex education or knowledge of family planning methods'.³¹ While elaborating its contents it was considered to be an 'education about population and economic development', 'a high birth rate and a high death rate', and 'national income and *per capita* income'; 'the difference in birth rates in different countries and their relevance to their differing degrees of economic development and levels of welfare; the costs of human resource development and the availability of financing these costs with particular reference to the numbers involved; the economic and welfare aspects of large and small families, and the extent to which family size is a matter of deliberate choice and human regulation rather than accident or of forces beyond human control'.³² On another occasion during the Seminar, population education was regarded as 'the economics and the sociology of the growth of population, its distribution and its relation to the standard of living and its ultimate economic and social consequences'³³.

The Draft Syllabus on Population Education prepared by the National Council of Educational Research and Training tried to define population education and explain its meaning in a more comprehensive and concrete way.³⁴ The task was not

so easy, as there were a number of misgivings about this concept. Population education was viewed as a family planning education by many. Some people regarded it as 'an euphemism for sex education' and to another group of people it was an integral part of developmental education which enveloped under its fold environmental education, value education, productivity education, consumer education and so on. It was also treated as synonymous to the teaching of demography or population studies.³⁵ However, the Draft Syllabus defined population education quite distinctly based on the following recommendations made by the National Seminar:

- (i) 'The objective of population education should be to enable the students to understand that the family size is controllable, that population limitation can facilitate the development of a higher quality of life in the nation and that a small family size can contribute materially to the quality of living for the individual family. It should also enable the students to appreciate the fact that, for preserving the health and welfare of the members of the family, to ensure the economic stability of the family and to assure good prospects for the younger generation, the Indian families of today and tomorrow should be small and compact...'
- (ii) 'Students at all levels have a right to acquire information about the effect of changes in family size and in national population on the individual, the family and the nation, so that this body of knowledge is utilised to control family size and national population with beneficial impact on the economic development of the nation and the welfare of the individual families'.³⁶

The Draft Syllabus reflected the ideas contained in these recommendations in its definition of population education and in selection of its contents. Since then the concept of population education has gradually evolved by adapting itself to the changing needs and requirements and incorporating emerging concerns. While promotion of the observance of the small family norm has been the basic concern of population education, its approach has been to present to students the multi-faceted aspects of the population situation at macro and micro levels with clear-cut emphasis on cause and effect relationship. It cannot be prescriptive. Population education in India is aimed at transmitting how to identify problems and seek their solutions rather than conveying only assertions. 'Population education thus is an educational innovation aimed at making the target groups aware about the interrelationships between population and development. It endeavours to bring the idea home that the decisions taken by every person in respect of population phenomena at individual, community, societal and national levels affect the course of development and the status of individual and national quality of life. It is

basically an education in human resource development. The ultimate objective of this education is to bring about an attitudinal change in the people toward such socio-cultural norms, traditional beliefs and values that promote pro-natality among them and prevent an articulate appreciation of development perspectives. It is hoped that by doing so population education will enable its target groups to take rational decisions regarding population issues³⁷ and their behaviour will contribute towards promotion of the small family norm.

Conceptual Framework of Population Education

The above mentioned formulation of the meaning of population education formed the basis for development of the conceptual framework of population education. To begin with it was demography laden, but gradually quality of life became its integral part. It is now largely a value laden concept consequent upon the stipulations made in the National Policy on Education 1986. The conceptual framework now is built around six major themes. These are : (i) Family Size and Family Welfare; (ii) Delayed Marriage; (iii) Responsible Parenthood; (iv) Population Change and Resource Development; (v) Population related Beliefs and Values; and (vi) Status of Women. The content focussing on these themes are drawn from six content areas : (i) Population and Economic Development; (ii) Population and Social Development; (iii) Population, Environment and Resources; (iv) Population and Family Life; (v) Population, Health and Nutrition; and (vi) Population Dynamics.³⁸ The new emerging issues such as problems of adolescents, sexually transmitted diseases like AIDS, urbanisation and concern for the aged are woven into this conceptual framework.

National Population Education Programme

A National Population Education Programme was launched in India in April 1980 with a view to introducing this educational innovation in the existing education system. However, before the formal launching of the programme the Population Education Unit, set up in the National Council of Educational Research and Training on the basis of the recommendations of the National Seminar on Population Education, developed a number of curricular, textual, instructional and source materials. Other agencies also prepared materials and conducted relevant activities in this area. The prominent agencies were the Family Planning Association of India, the Central Health Education Bureau, the Population Studies Centres of Sri Venkateswara University, Tirupathi and of M.S. University, Baroda and the Pathfinder Fund's Population Education Project, Delhi. These efforts

helped a great deal in preparing a congenial climate for the launching of the Population Education Programme.

However, there was an earnest need for the actual extension of the above mentioned developmental efforts to school and other educational institutions in the states and union territories throughout the length and breadth of the country. It was with this end in view that a National Population Education Project was launched aiming at the institutionalisation of population education in the existing education system. Since then the project has run through two cycles and its third cycle will start from January 1991. In the first cycle (1980-85) the accent of the project activities was on expansion. The project brought under its fold 28 states and union territories, where activities were conducted for students and teachers of primary, upper primary and secondary stages and for pupil teachers of elementary and secondary teacher education. During the second cycle (1986-90), the main focus has been on consolidation of the multi-dimensional project activities and further expansion to cover the senior secondary stage and the non-formal education sector. Besides the project in School and Non-Formal Education system, two separate projects are also being implemented, one in the Adult Education sector and the other in the University Education sector by the Directorate of Adult Education, Government of India and the University Grants Commission respectively. The three projects are designed to ensure institutionalisation of population education into the entire education system of the country and to promote functional coordination among all the sectors of education through effective institutional arrangement.

With a view to institutionalising population education, various kinds of educational activities are conducted in order to make it an integral part of the entire education system. A broad strategy of integration has been adopted for development of different types of materials, incorporation of population education contents into existing syllabi and textbooks, making it a part of the on-going examination system, training of teachers and other functionaries, organising curricular and co-curricular activities and evaluation of various activities. Population education is not treated as a separate subject or a separate educational activity. Accordingly, since the inception of the project, attempts have been made at various levels to integrate the elements of population education in almost all aspects of school education and teacher education.

Future Directions

The National Population Education Project has covered much ground towards achieving its ultimate objective of institutionalising population education.

However, there is an urgent need to sustain the momentum and to complete the unfinished tasks. It is equally imperative to fill the existing gaps. With this end in view the project is being extended and it will enter into its third cycle from January 1991. The main thrusts³⁹ of the project during the forthcoming period would be as follows:

Non-Formal Education

The experience of working in the area of non - formal education under the project have been limited so far. The project activities have been confined to developing prototype materials and orienting instructors as well as other functionaries. It is therefore felt that the focus of the project should now shift to the non-formal education. There is a very large target group of students and facilitators who need to be covered. Since the limitations of the existing non-formal education system are well known, functional and effective strategies will have to be evolved carefully to institutionalise population education in this area.

Effective Integration of Population Education

The process of integrating population education contents into the syllabi, textbooks and other instructional materials will continue. As a follow up of the National Policy on Education 1986, the revision of syllabi and textbooks is going on in States. In order to facilitate effective integration, meaningful activities will have to be conducted. A core package of different types of materials will be developed at the national level and efforts will be made to promote its use in the states.

Teacher Training

As a follow up of the National Policy on Education 1986, the system of teacher education is being restructured. In the new scheme of teacher education, the District Institutes of Education and Training (DIETs) and Colleges of Teacher Education (CTEs) will play a crucial role in respect of pre-service and in-service teacher education both at elementary and secondary levels. Moreover, the reorientation of content and process of teacher education is also taking place. The National Council of Teacher Education (NCTE) is providing technical backstopping in this area. In the context of these changes, concerted efforts will be needed to establish effective linkages with the new emerging infrastructures and processes, so that population education becomes an integral part of teacher education.

Audio-Visual Material and Use of Electronic Media

With the launching of the Indian communication satellite and in view of a very large number of schools being provided with television sets, a greater emphasis will be laid on the development of a.v. material to promote wide use of electronic media.

Documentation Centre

In view of the enormous increase in the volume and range of materials on population education there is an urgent need to ensure a flow and exchange of information and materials among concerned organisations and interested persons. To facilitate this process, a Documentation Centre will be established in NCERT in order to perform the role of a "clearing house". Besides catering to the needs of various institutions and persons in the area of school and non-formal education, the Centre will establish linkages with the Directorate of Adult Education and the University Grants Commission and also with international information centres working in the field of population education.

Co-Curricular Activities

In the context of new approaches to education, it is strongly felt that innovative activities should be organised more frequently both within and outside the schools. Such activities are necessary in order to inculcate proper attitude and value orientation in the learners. Attempts are therefore being made to organise such programmes at regular intervals to sustain the general interest and to maintain a high level of motivation especially among students and teachers.

Evaluation

During the third cycle, efforts will be made to strengthen the in-built mechanism of evaluation for receiving regular feedback. Special emphasis in the field of evaluation will be on fostering local initiative and participation so that suitable expertise is developed in the states.

Research

A number of research studies that have been conducted so far, are mainly related to family planning, population control and demography, and as such they are of very limited value to the area of population education. Very few research studies have

direct bearing on and application to the population education programme. There is, therefore, a need to strengthen the research component. On the one hand efforts will be made to identify suitable areas such as the interrelationship between the small family norm and quality of life, curriculum transaction in real class-room situation and population education related issues for conducting research during the next five years; on the other hand the strategy of promoting research through funding will be evolved and adopted for ensuring research support to what is being advocated and done under the project.

REFERENCES

1. *The Population Card* is an 'educational instrument', which 'calculates and displays, at any desired point in time between the year 1989 and 2020, the estimated population of the world as well as of each of the 165 countries for which data has been input'. Commissioned by the United Nations Population Fund (UNFPA), it was produced on the basis of the *Population Clock* which was produced in 1987. See Nafis Sadik, 'Message from the Executive Director', *Operation reference manual*, New York, UNFPA, 1989.
2. *Ibid*
3. Arjun Adalakha, 'India', in Thomas W. Merrick, *et al.*, *Population Bulletin: World Population in Transition*, Vol. 41, No. 2, April 1986, pp. 42-43.
5. See Anita Katyal, 'New plan to boost small family norm', *The Times of India*, February 28, 1990.
6. Kurt Waldheim, 'Foreword' in the United Nations Fund for Population Activities, *The United Nations and Population: Major Resolutions and Instruments*, New York, UNFPA, 1974.
7. Government of India, *Revised Strategy for National Family Welfare Programme: A Summary*, New Delhi, Department of Family Welfare, Ministry of Health and Family Welfare, 1986, p. 5.
8. See Arjun Adalakha, *op. cit.*, p. 43.
9. See Debabar Banerji, 'Population Policies and Programmes In India during the last Ten Years', in S.N. Singh, *et al.*, (eds.), *Population Transition in India*, Vol. 1, Delhi, B.R. Publishing Corporation, 1989, pp. 45-54.
10. Government of India, *National Policy on Education—1986*, New Delhi, Ministry of Human Resource Development, Government of India, Department of Education, 1986, p. 2, para 1.13.
11. *Ibid*, p.2, para 1.10.
12. *Ibid*, p.4, para 3.4.
13. Government of India, *National Policy on Education—1986: Programme of Action*, New Delhi, Ministry of Human Resource Development, Department of Education, November 1986, pp.143-144.
14. Government of India, *National Policy on Education-1986*, *op. cit.*, p. 6, para 5.2.
15. *Ibid*, p. 6, para 4.2.

16. *Ibid*, pp. 2-3, para 1.1.
17. *Ibid*, p. 9, para 4.12.
18. *Ibid*, p. 11, para 5.5.
19. *Ibid*, p. 23, para 8.15.
20. *Ibid*, para 8.18.
21. *Ibid* p. 21, para 8.5.
22. *Ibid*, p. 29, para 12.2.
23. Avabai B. Wadia, *Population Education for the Younger Generation*, Bombay, Family Planning Association of India, 1981, p. 85.
24. *Ibid*, pp. 126-34.
25. T.S. Mehta, *et. al.*, (eds.), *National Seminar on Population Education*, August 2-3, 1969, New Delhi, National Council of Educational Research and Training, 1969, p.9.
26. See B.S. Parakh, *Population Education : Inception to Institutionalisation*, New Delhi, National Council of Educational Research and Training, 1985, pp. 18-19.
27. Jawaharlal Pandey, "Introduction" *Ibid*, pp. xviii-xiv.
28. Jacqueline D. Sherris and Wayne F. Quillin, *Population Reports : Population Education in the Schools*, Series M, Number 6, March-April, 1982, Baltimore, The Johns Hopkins University, p. M204.
29. V.K.R.V. Rao, 'Inaugural Speech', in T.S. Mehta, *et.al.*, (eds.), *National Seminar on Population Education*, *op cit.*, p. 3.
30. *Ibid*
31. *Ibid*, p.4.
32. *Ibid*
33. S. Chandrashekar, 'Validictory Address', in T.S. Mehta, *et al.*, (eds.) *National Seminar on Population Education*, *op. cit.*, p.13.
34. See NCERT, *Population Education : A Draft Syllabus*, New Delhi, National Council of Educational Research and Training, 1971, pp. 7-8.
35. See Jawaharlal Pandey, 'Introduction', *op. cit.*, p.x.
36. T.S. Mehta, *et al.*, (eds.), *National Seminar on Population Education*, *op. cit.*, p. 9.
37. Jawaharlal Pandey, 'Introduction', *op. cit.*, p. XVIII.
38. See NCERT, *Minimum Essential Contents of Population Education*, New Delhi, NCERT, August 1988.
39. See the Background Paper on the Extension of NPEP into the Eighth Five Year Plan, annexed to the Agenda Papers of the Thirteenth Meeting of the National Steering Committee of Population Education Programme, held on 20 September, 1989.

SECTION - II
POPULATION SITUATION



Population Dynamics

MAHENDRA K. PREMI AND PREM C. SAXENA

POPULATION SITUATION

The World Population

During the last four decades since the second world war, the world has witnessed an unprecedented population growth particularly in its less developed regions. This has aroused world-wide interest in the study of population dynamics and its impact on economic and social development. There is a growing awareness of the consequences of unabated population growth which is likely to upset the balance between people and resources, between the hopes and aspirations of the people and the opportunities available to them. It is increasingly realised that a rise in population is linked with economic and social change, which includes an increase in the demand for agricultural production, employment opportunities, health care services and other services.

The large populations and rapid rates of growth, as are found in most of the developing world, are recent phenomena. In fact, it took all of human history up to the middle of the 19th century to have one billion (1,000,000,000) people living simultaneously in the world and slightly more than a century to add the second billion to the world's total. Since then, nearly one billion people are added to the world population every 12 years. According to the latest estimates of the United Nations, the population of the world reached five billion in the middle of 1988. If the present rate of growth of population is continued, world population will cross the six billion mark by the turn of the 20th century.

To give a historical perspective of the growth of world population, Table 3.1 presents the estimates of the size and growth rate of world population from 1750-1985. It also provides the 'population doubling time'¹ in years (at the current rate) to give some indication of the potential effect of different levels of the rate of natural increase. It may be seen from the table that the maximum rate of growth of the world population was during 1960-65 and thereafter it has recorded a decline. Although the rate of growth of world population is on the wane, the ever-expanding numbers of people in the less-developed countries will continue to pose new challenges before their governments to fulfil the promises of higher economic growth and a better life.

Table 3.1: Estimates of size and growth of world population, 1750-1989

<i>Year</i>	<i>World population (in million)</i>	<i>Annual rate of increase (per cent)</i>	<i>Population doubling time (years)</i>
1750	791		
1800	978	0.4	175
1850	1,262	0.5	140
1900	1,650	0.5	140
1950	2,513	0.8	87
1955	2,745	1.8	39
1960	3,027	2.0	35
1965	3,344	2.0	35
1970	3,678	1.9	37
1975	4,033	1.8	39
1980	4,415	1.8	39
1985	4,845	1.7	41
1989	5,234	1.8	39

Sources : John D. Durand, "The modern expansion of world population", *Proceedings of the American Philosophical Society*, Vol. III (3), 1967, p. 137.

United Nations, *World Population Trends and Prospects by Country, 1950-2000: Summary Report of the 1978 Assessment*, Department of International Economic and Social Affairs (ST/ESA/SER, R/33), New York, 1979, p. 4.

Population Reference Bureau Inc., *World Population Toward the Next Century*, Washington, D.C., May, 1985.

Population Reference Bureau, Inc., *1989 World Population Data Sheet*, Washington, D.C., April, 1989.

Population of Developed and Less Developed Regions of the World

According to the population estimates provided by the Population Reference Bureau for mid-1985, out of 4,845 million inhabitants of the world, 3,671 million lived in less-developed regions. This implies that a major share of world population

(more than 75 per cent) inhabits the less developed regions (Table 3.2). The data clearly reveal a phenomenal increase in the size of the population of the less-developed regions of the world.

Table 3.2: Estimated populations of more-developed and less-developed regions, 1750-1989

<i>Year</i>	<i>World population (in million)</i>	<i>More developed regions</i>	<i>Less developed regions</i>
		<i>Population (in million)</i>	<i>Population (in million)</i>
1750	791	201	590
1800	978	246	732
1850	1,262	342	920
1900	1,650	561	1,089
1950	2,513	832	1,681
1970	3,678	1,050	2,628
1980	4,415	1,131	3,284
1985	4,845	1,174	3,671
1989	5,234	1,206	4,028

Sources : Same as for Table 3.1

These regions comprise countries of Asia, Africa and Latin America; except Japan and the USSR. It is noteworthy that out of the three-quarters of the world population living in less developed regions, about 75 per cent is concentrated in Asia alone (Table 3.3). In Asia, China and India are the two most populous countries and, together, they account for about 37 per cent of the world population. Among the South Asian countries, India, Pakistan and Bangladesh have been the main contributors to the present size of the population of this region.

The rapid population increase poses a serious threat to development efforts of the less-developed countries. The problem of population is not merely quantitative but also qualitative in nature, as the implications of population growth on the quality of

Table 3.3: Estimated population of less and more-developed regions, 1975, 1980, 1985 and 1989

Region	Population (in million)			
	1975	1980	1985	1989
LESS DEVELOPED REGIONS	2,990	3,284	3,671	4,029
AFRICA	408	469	551	646
Northern Africa	94	109	128	142
Western Africa	121	141	166	200
Eastern Africa	115	134	159	194
Middle Africa	47	53	62	66
Southern Africa	29	33	37	44
LATIN AMERICA	323	368	406	438
Central America	79	93	105	115
Caribbean	28	30	31	33
Tropical South America	177	204	225	242
Temperate South America	38	41	46	48
ASIA	2,207	2,441	2,708	2,938
East Asia (Excluding Japan)	952	1,019	1,173	1,198
South Asia	1,255	1,422	1,535	1,740
MORE DEVELOPED REGIONS	1,093	1,131	1,174	1,206
North America	236	246	264	275
Japan	112	116	121	123
Europe	474	484	492	499
Australia and New Zealand	17	18	19	20
USSR	254	267	278	289

Sources : John D. Durand, "The modern expansion of world population", *Proceedings of the American Philosophical Society*, Vol. III (3), 1967, p. 137.

United Nations, *World Population Trends and Prospects by Country, 1950-2000: Summary Report of the 1978 Assessment*, Department of International Economic and Social Affairs (ST/ESA/SER, R/33), New York, 1979, p. 4.

Population Reference Bureau Inc., *World Population Toward the Next Century*, Washington, D.C., May, 1985.

Population Reference Bureau, Inc., *1989 World Population Data Sheet*, Washington, D.C., April, 1989.

life and the well-being of the people are of paramount importance. The future growth of population in less-developed countries has relevance to health problems, food supplies, education, housing, employment, etc. If resources are not mobilized to meet the increase in the demand for these basic necessities, the increase in the population will very much affect the quality of life.

Population of India

Size and Growth

The changes in the size and growth of the India's population are considered here in terms of two broad periods, namely (a) the pre-modern period; and (b) the modern period. The year 1881 marks the dividing line between the pre-modern and the modern periods, as it was the year when the first census on a country-wide basis was taken in India².

Population growth in pre-modern period: It appears that during ancient times no systematic efforts were made to ascertain the total population of India. From historical evidences one gathers, however, that some three-to seven-thousand years ago India possessed a technology sufficiently advanced to support a dense and slowly growing population³. Ancient India passed through two highly developed civilizations, namely (i) the urban-metropolitan; and (ii) the great pastoral agricultural civilization of the Aryans (1,500 B.C. - 600 B.C.). It is believed that during the periods of these two highly developed and flourishing civilizations, living conditions improved, bringing down mortality and morbidity. A decline in the level of mortality might have resulted in population growth. Though the long-term population trend seems to be one of growth, short-term fluctuations in the population size did occur due to wars and natural catastrophies like famine, floods, epidemics, etc.

Some impressions of the facts about the population of ancient India can be gathered from the writings of foreign scholars who visited India during its prosperous periods. According to Herodotus (490 B.C.), India was the most populous of the countries in the world. Alexander's army which invaded India in 327-326 B.C., found a large population there. One small kingdom was said to have 37 towns of over 5,000 inhabitants each. India's first real empire under Chandragupta Maurya (321-297 B.C.) left records indicating the existence of a standing army of approximately 700,000 men. Only a very substantial population could have supported such a large army⁴.

It may be noted that the accounts regarding the population referred to in the preceding paragraph relate to conditions in northern India (north of the Vindhya and Satpura ranges). But contemporaneous with or only a little later than the Aryan culture of the Ganges and the Mohenjodaro culture of the Indus, were the almost equally advanced civilizations in the south. Historical evidences suggest that prior to the Christian era, India already had a substantial population. This view was confirmed by Pran Nath who, after a painstaking survey of the literature, concluded that the population of India around 300 B.C. was between 100 and 140 million⁵.

While making an estimate of India's population for the year 1600, Moreland (1920) cited contemporary accounts to show that in the fifteenth and sixteenth centuries Europeans were impressed by the density of settlements in India, both on the plains and in the Deccan. In fact, some visitors considered the country to be over-populated even at that time. Their accounts indicate that India had cities of a quarter-to half-a-million in size. Taking into account the strength of the army in the south and the land under cultivation in Akbar's empire, for which contemporary figures are available, and making adjustments for areas about which little was known, Moreland concluded that the total population of India at that time was around 100 million⁶.

Moreland's estimates were considered to be on the low side by Davis (1951)⁷ and Das Gupta (1972)⁸. Davis, on the basis of his arguments, concluded that the population of the Indian subcontinent in the year 1600 was 125 million whereas the estimate given by Das Gupta for the same period was 135 million.

There are two more estimates of population of the Indian subcontinent for 1600— one by Datta (1960) at 110 million,⁹ and the other by Durand (1967) at 140 million¹⁰. Thus, various available estimates of the population for 1600 indicate that the population of the Indian subcontinent at the beginning of the seventeenth century was between 100 million and 140 million. It appears that the growth of the population of the subcontinent was more or less stationary and staggered between 100 and 140 million.

For A.D. 1750, Davis (1951) estimated the population of the subcontinent to be 125 million. He assumed that his estimate of 125 million for A.D. 1600 had remained at the same level during the next century and a half. The estimate of the population for the year 1800 given by Mahalanobis and Bhattacharya (1976) was 207 million¹¹.

Table 3.4 summarizes various estimates of the population of the Indian subcontinent discussed above. Also, it gives the corrected 1871 figures. There is

wide variation in these estimates, which casts doubt on the accuracy of the estimates for earlier years. If, for example, the estimate given by Davis for A.D. 1750 and that of Mahalanobis and Bhattacharya for A.D. 1800 are accepted, then it implies that the population of the subcontinent had increased about 66 per cent, or at the rate of 1.01 per cent per annum during 50 years. Further, if the estimate for 1800 is true, the increase by 1871 accounted for a growth rate of about 0.3 per cent per annum. This implies that the population estimates given for 1750 and earlier periods are on the lower side and the researchers estimated the population of India to be much smaller than it really was.

Table 3.4 : Estimates of India's population, 300 B.C. to A.D. 1871

<i>Year</i>	<i>Population (in million)</i>	<i>Estimate provided by</i>
300 B.C.	100 - 140	Pran Nath (1929)
A.D. 1600	100	Moreland (1920)
	125	Davis (1951)
	135	Das Gupta (1972)
	110	Datta (1960)
	140	Durand (1967)
A.D. 1750	125	Davis (1951)
A.D. 1800	207	Mahalanobis and Bhattacharya (1976)
A.D. 1871	255	Census of India (1871)

Source : Davis, Kingsley, op. cit., p. 25.

Population growth in the modern period: As stated earlier, the modern period has been synchronized with the period of modern comprehensive censuses starting in 1881. Since then, the count has been made regularly every ten years. Prior to 1881, however, a population census was conducted during 1871-72, but it was non-synchronous and omitted several territories, the population of which totalled around 33 million in 1881. Table 3.5 gives an account of the size and growth of India's population since 1891.

Table 3.5: Population of India and its growth, 1891-1981

Year	Population (in million)	Decennial change (per cent)	Growth rate ** (per cent per year)	
			Arithmetic	Geometric
1891	235.9	-	-	-
1901	238.4	1.06	0.11	0.11
1911	252.0	5.75	0.58	0.56
1921	251.3	-0.31	-0.03	-0.03
1931	279.0	11.00	1.10	1.04
1941	318.7	14.22	1.42	1.33
1951	361.1	13.31	1.33	1.25
1961	439.2	21.64	2.16	1.95
1971	548.2	24.80	2.48	2.20
1981	685.2*	25.00	2.50	2.25

Source : Registrar General of India.

Notes : * Includes projected population of Assam, where the 1981 census could not be conducted owing to disturbed conditions prevailing in that state at the time.

** If P_o and P_t are the population of a country/region at times o and t , respectively, then the rate of growth, between two-time-points is calculated as under :

Arithmetic rate of growth

$$r = [(P_t - P_o) / (P_o \cdot t)] \cdot 100$$

$$= [\text{Increase (or decrease) in population} / \text{Base population} \cdot \text{Number of years}] \cdot 100$$

Geometric rate of growth

$$r = [\text{Anti log } 1/t \cdot \log (P_t/P_o)] - 1] \cdot 100$$

Before discussing the growth pattern of India's population we should put forward a few observations on the quality of the census enumeration. In the earlier censuses, upto 1901, it is believed that there was additional coverage of the territories not

covered previously and there were improvements in enumeration as well¹². Further, until the 1931 census, the enumeration was one-night *de facto* affair in which all movements of the people were stopped and enumerators collected information about each person at the place of enumeration. This required a large army of enumerators to cover the entire population of the country in one day and provided little supervision of the enumerators' work. Since no post-enumeration checks (PEC) were conducted in the earlier censuses, it is difficult to say about their overall quality.

From 1941 onward, the system of census taking in India was changed to an extended *de jure* type in which the census enumeration was spread over a period of roughly three weeks (generally in the month of February). Post-enumeration checks (PEC) were built into the census enumeration procedures from 1951 onwards. The method was improved further in the 1961 census and has continued in the 1971 and 1981 censuses. In the PEC, a sample of households (roughly one in a thousand) is selected and the selected households are enumerated again within a month of the actual census taking. A comparison of the actual census results and those of the PEC gives the extent of error in a census. The censuses of 1951, 1961, 1971 and 1981 have indicated a net under-count of 1.1 per cent, 0.5 per cent, 1.7 per cent and 1.8 per cent respectively. Such an extent of under-count is observed in the censuses of many countries round the world. In fact, there are several countries where the extent of under-count in the census is found to be much larger. We may, therefore, say that by and large, the quality of census enumeration in India is good and the census count has, on the whole, been close to reality.

The history of population growth in India since 1891 can be divided into three parts, the points of division being 1921 and 1951. The year 1921 is called the year of the 'Great Divide' because it distinguished the earlier period of chequered population growth from a period of moderately increasing growth. The year 1951 marks the beginning of three decades of accelerated population growth.

Mortality levels were responsible for variation in the growth rates of the population during the 30 years prior to the year 1921. In fact, the decade 1901-11 witnessed several local famines and a severe famine in 1907 in most parts of Uttar Pradesh. Plague was in evidence in the Bengal and Bombay Presidencies, and both plague and malaria were widespread in the Punjab and Uttar Pradesh, where population growth was negligible. Nonetheless, since the country as a whole suffered from famine less widely and for shorter duration there was an appreciable rise in the population growth rate compared with the previous decade.

During the next decade, 1911-20, the country suffered from an influenza epidemic which caused deaths of an estimated 7 per cent of the total population. It

was much more virulent in some provinces than in others¹³

Since 1921, the major causes of high mortality have been gradually brought under control, and between 1921 and 1951 India witnessed a gradual rise in the trend of population growth rates. The decline in the level of mortality became steep after independence in 1947, with the result that population nearly doubled from an estimated 347.5 million in 1947 to 685.2 million in 1981. The steep decline in mortality rate was mainly due to success in controlling epidemics like plague and smallpox and on account of advancement in medical technology in the West during the last three decades.

Population Distribution by Zones and States

Like in other countries, in India too the changes in the spatial distribution and growth of population have largely been influenced by the interplay of geographical, historical, social and cultural factors. Ancient cultures and imperial regimes have influenced population dynamics of the country over a long past and their impact is visible on the pattern even today. In this section, an attempt is made to briefly describe the changes in the pattern of population distribution and growth in India since the beginning of this century.

The population and area of various states and zones of India, for the 80-year period from 1901 to 1981 is given in Table 3.6. The percentage share of each zone and each state and union territory in the total population of the country at the various censuses is given in Table 3.7

Madhya Pradesh, in the central zone, is geographically the biggest state in the country, accounting for 13.5 per cent of the total land area. Uttar Pradesh is largest in population. In fact, the two states together, forming the central zone, at present account for 22.4 per cent of the area and 23.8 per cent of the total population (Table 3.7). The share of the country's population enumerated in the central zone consistently declined from 27.5 per cent in 1901 to 23.7 per cent in 1971. In contrast, the share of the country's population enumerated in the eastern zone has continuously increased over the past 80 years, except in 1951 when it declined slightly owing to the exodus of Muslims to newly-created Pakistan. The share of the country's population in the southern zone increased until 1951, when it was 26.2 per cent, and has been monotonically declining ever since, becoming 24.1 per cent in 1981.

* The Indian census divides the country into five zones—north, south, east, west and central. In Tables 3.6 and 3.7, the states and union territories are grouped according to these zones.

Table 3.6 : Distribution of population and area in different states and zones of India, 1901-81

<i>Zone/State and Union territory</i>	<i>Area in km² (1971)</i>	<i>Population according to 1971 boundaries</i>			
		<i>1901</i>	<i>1911</i>	<i>1921</i>	<i>1931</i>
I. Northern Zone	716 306	26 949 401	26 511 476	26 560 514	29 675 580
Haryana	44 222	4 623 079	4 174 690	4 255 905	4 559 931
Himachal Pradesh	55 673	1 920 294	1 896 944	1 928 206	2 029 113
Jammu and Kashmir	222 236	2 139 362	2 292 535	2 424 359	2 670 208
Punjab	50 362	7 544 790	6 731 510	7 152 811	8 012 325
Rajasthan	342 214	10 294 090	10 983 509	10 292 648	11 747 974
Chandigarh	114	21 967	18 437	18 133	19 783
Delhi	1 485	405 819	413 851	488 452	636 246
II. Eastern Zone	688 140	58 910 511	62 865 003	62 873 459	70 046 983
Assam ^a	99 610	3 372 114	3 939 821	4 735 386	5 684 775
Arunachal Pradesh ^b	83 578	-	-	-	-
Bihar	173 876	27 311 865	28 314 281	28 126 675	31 347 108
Manipur	22 356	284 465	346 222	384 016	445 606
Meghalaya	22 489	340 524	394 005	422 403	480 837
Nagaland	16 527	101 550	149 038	158 801	178 844
Orissa	155 782	10 302 917	11 378 875	11 158 586	12 491 056
Sikkim	7 299	59 014	87 920	81 721	109 808
Tripura	10 477	173 325	229 613	304 437	382 450
West Bengal	87 853	16 940 088	17 998 769	17 474 348	18 897 036
Andaman and Nicobar Islands	8 293	24 649	26 459	27 086	29 463
Mizoram	-	-	-	-	-
III. Central Zone	737 254	65 488 423	67 595 873	65 844 148	71 135 195
Madhya Pradesh	442 841	16 860 768	19 440 965	19 171 750	21 355 657
Uttar Pradesh	294 413	48 627 655	48 154 908	46 672 398	49 779 538

Contd. Table 3.6

Zone/State and Union territory	Area in km ² (1971)	Population according to 1971 boundaries			
		1901	1911	1921	1931
IV. Western Zone	508 050	29 018 189	31 826 352	31 556 607	36 029 098
Gujarat	195 984	9 094 748	9 803 587	10 174 989	11 489 828
Maharashtra	30 762	19 391 643	21 474 523	20 849 666	23 959 300
Dadra and Nagar Haveli	491	24 280	29 020	31 048	38 260
Goa, Daman and Diu ^c	3 813	507 518	519 222	500 904	541 710
V. Southern Zone	638 032	58 029 803	63 294 686	64 486 485	72 090 382
Andhra Pradesh	276 814	19 065 921	21 447 412	21 420 448	24 203 573
Kerala	38 864	6 396 262	7 147 673	7 802 127	9 507 050
Karnataka	191 773	13 054 754	13 525 251	13 377 599	14 632 992
Tamil Nadu	130 069	19 252 630	29 902 616	21 628 518	23 472 099
Pondicherry	480	246 354	257 179	244 156	258 628
Lakshadweep	32	13 882	14 555	13 637	16 040
India	3 287 782	238 396 327	252 093 390	251 321 213	278 977 238

Sources: Census of India, 1901-1981.

Note: a Includes the Union Territory of Mizoram up to 1961.

b Census for the first time in 1961.

c Goa as a State and Daman & Diu as a Union Territory have been separated.

Table 3.6: Distribution of population and area in different states and zones of India, 1901-81

<i>Zone/State and</i>		<i>Population according to 1971 boundaries</i>				
<i>Union territory</i>		<i>1941</i>	<i>1951</i>	<i>1961</i>	<i>1971</i>	<i>1981</i>
I. Northern Zone		34 887 426	38 213 054	48 033 146	61 753 689	80 489 213
Haryana		5 272 845	5 673 614	7 590 543	10 036 808	12 850 902
Himachal Pradesh		2 263 245	2 385 981	2 812 463	3 460 434	4 237 569
Jammu and Kashmir		2 946 728	3 253 852	3 560 976	4 616 632	5 981 600
Punjab		9 600 236	9 160 500	11 135 069	13 551 060	16 669 755
Rajasthan		13 863 859	15 970 774	20 155 602	25 765 806	34 102 912
Chandigarh		22 574	24 261	119 881	257 251	450 061
Delhi		917 939	1 744 072	2 658 612	4 065 698	6 196 414
II. Eastern Zone		80 941 784	90 157 264	113 648 891	142 517 257	177 698 389
Assam		6 847 576	8 225 058	11 103 392	14 625 152	19 902 826
Arunachal Pradesh ^b		-	-	336 558	467 511	628 050
Bihar		35 170 840	38 782 271	46 447 457	56 353 369	69 823 154
Manipur		512 069	577 635	780 037	1 072 753	1 433 691
Meghalaya		555 820	605 674	769 380	1 011 699	1 327 874
Nagaland		189 641	212 975	369 200	516 449	773 281
Orissa		11 767 988	14 645 946	17 548 846	21 944 615	26 272 054
Sikkim		121 520	137 725	162 189	209 841	315 682
Tripura		511 010	639 029	1 142 005	1 556 342	2 060 189
West Bengal		21 229 552	26 299 980	34 926 279	44 312 001	54 485 560
Andaman and Nicobar Islands		33 768	30 971	63 548	115 113	188 254
Mizoram		-	-	-	332 390	487 774
III. Central Zone		80 525 762	89 291 292	106 126 962	129 995 263	162 989 736
Madhya Pradesh		23 990 608	26 071 637	32 372 408	41 654 119	52 131 717
Uttar Pradesh		56 535 154	63 219 655	73 754 554	88 341 144	110 858 019

Contd. Table 3.6

Zone/State and Union territory	Population according to 1971 boundaries				
	1941	1951	1961	1971	1981
IV. Western Zone	41 158 486	48 902 812	60 871 698	78 041 651	97 840 597
Gujarat	13 701 551	16 262 657	20 633 350	26 697 475	33 960 905
Maharashtra	26 832 758	32 022 564	39 553 718	50 412 235	62 693 898
Dadra and Nagar Haveli	40 441	41 532	57 963	74 170	103 677
Goa, Daman and Diu ^c	583 736	596 059	626 667	857 771	1 082 117
V. Southern Zone	81 147 122	94 523 668	110 554 074	135 851 782	164 792 116
Andhra Pradesh	27 289 340	31 115 259	35 983 447	43 502 708	53 403 619
Kerala	11 031 541	13 549 118	16 903 715	21 347 375	25 403 217
Karnataka	16 255 368	19 401 956	23 586 772	29 299 014	37 043 451
Tamil Nadu	26 267 507	30 119 047	33 686 953	41 199 168	48 297 456
Pondicherry	285 011	317 253	369 079	471 707	604 136
Lakshadweep	18 355	21 035	24 108	31 810	40 237
India	318 660 580	361 088 090	439 234 771	548 159 652	683 810 051

Sources: Census of India, 1901-1981.

Note: a Includes the Union Territory of Mizoram up to 1961.

b Census for the first time in 1961.

c Goa as a State and Daman & Diu as a Union Territory have been separated

Table 3.7: Percentage distribution of population and area in different states and zones of India, 1901-81

Zone/State and Union territory	Area in km ² (1971)	Percentage distribution of population									
		1901	1911	1921	1931	1941	1951	1961	1971	1981	
I. Northern zone	21 79	11 30	10 52	10 56	10 64	10 95	10 99	10 94	11 27	11 77	
Haryana	1 35	1 94	1 66	1 68	1 63	1 65	1 57	1 73	1 83	1 88	
Himachal Pradesh	1 69	0 81	0 75	0 77	0 73	0 71	0 66	0 64	0 63	0 62	
Jammu and Kashmir	6 76	0 90	0 91	0 96	0 96	0 92	0 90	0 81	0 84	0 87	
Punjab	1 53	3 15	2 67	2 85	2 86	3 01	2 54	2 54	2 47	2 44	
Rajasthan	10 41	4 32	4 36	4 10	4 21	4 35	4 43	4 59	4 70	4 99	
Chandigarh	n	0 01	0 01	0 01	0 01	0 01	0 01	0 02	0 05	0 06	
Delhi	0 05	0 17	0 16	0 19	0 23	0 29	0 48	0 61	0 74	0 91	
II. Eastern zone	20 93	24 71	24 94	25 02	25 11	25 40	24 96	25 88	26 00	25 98	
Assam ^a	3 03	1 41	1 56	1 88	2 04	2 15	2 28	2 53	2 73	2 91	
Arunachal Pradesh ^b	2 54	.	.	.	.	.	.	0 08	0 09	0 09
Bihar	5 29	11 46	11 23	11 19	11 24	11 04	10 74	10 57	10 29	10 21	
Manipur	0 68	0 12	0 14	0 15	0 16	0 16	0 16	0 18	0 20	0 21	
Meghalaya	0 68	0 14	0 16	0 17	0 17	0 17	0 17	0 18	0 18	0 19	
Nagaland	0 50	0 04	0 06	0 06	0 06	0 06	0 06	0 08	0 09	0 11	
Orissa	4 74	4 32	4 52	4 44	4 48	4 32	4 06	4 00	4 00	3 84	
Sikkim	0 23	0 02	0 03	0 04	0 04	0 04	0 04	0 04	0 04	0 05	
Tripura	0 32	0 08	0 09	0 13	0 14	0 16	0 17	0 26	0 28	0 30	
West Bengal	2 67	7 11	7 14	6 95	6 77	7 29	7 28	7 95	8 08	7 97	
Andaman and Nicobar											
Islands	0 25	0 01	0 01	0 01	0 01	0 01	0 01	0 01	0 02	0 03	
Mizoram	.	.	.	.	.	.	.	.	.	0 07

Contd. Table 3.7

Zone/State and Union territory	Area in km ² (1971)	Percentage distribution of population									
		1901	1911	1921	1931	1941	1951	1961	1971	1981	
III. Central zone	22.42	27.47	26.81	26.20	25.50	25.27	24.73	24.16	23.71	23.83	
Madhya Pradesh	13.47	7.07	7.71	7.63	7.65	7.53	7.23	7.37	7.60	7.62	
Uttar Pradesh	8.95	20.40	19.10	18.57	17.85	17.74	17.50	16.79	16.11	16.21	
IV. Western zone	15.45	12.17	12.62	12.56	12.91	12.92	13.55	13.86	14.24	14.32	
Gujarat	5.96	3.81	3.88	4.05	4.12	4.30	4.50	4.70	4.87	4.97	
Maharashtra	9.36	8.13	8.52	8.30	8.59	8.42	8.87	9.01	9.20	9.17	
Dadra and Nagar Haveli	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	
Goa, Daman and Diu ^c	0.12	0.21	0.21	0.20	0.19	0.18	0.16	0.14	0.16	0.16	
V. Southern zone	19.41	24.35	25.11	25.66	25.84	25.46	26.17	25.17	24.78	24.10	
Andhra Pradesh	8.42	8.00	8.51	8.52	8.67	8.51	8.62	8.19	7.94	7.81	
Kerala	1.18	2.69	2.84	3.10	3.41	3.46	3.75	3.85	3.88	3.71	
Karnataka	5.84	5.48	5.37	5.32	5.26	5.10	5.37	5.37	5.34	5.42	
Tamil Nadu	3.96	8.08	8.28	8.61	8.41	8.24	8.34	7.67	7.52	7.06	
Pondicherry	0.01	0.10	0.10	0.10	0.08	0.09	0.08	0.08	0.09	0.09	
Lakshadweep	n	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	
India	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	

Sources: Census of India, 1901 - 81

Notes: a Includes the Union Territory of Mizoram

b Census for the first time in 1961.

c Goa as a State and Daman & Diu as a Union Territory have been separated.

n negligible.

The nine union territories¹⁴ (as per 1981 census) taken together accounted for only 9.8 million persons, 1.4 per cent of the country's total population. In population size, the largest of the nine is the almost entirely urban territory of Delhi, containing 6.2 million persons in 1981.

Uttar Pradesh has remained the most populous state in the country, followed by Bihar, over the entire period of 80 years. At the other extreme, Lakshadweep, with a population of 40.2 thousand in 1981, has ranked last throughout the period.

Between these two extremes, some of the states—Karnataka (eighth in population size), Rajasthan (tenth except in 1981, when it stepped up to ninth in rank), Kerala (twelfth), Jammu and Kashmir (sixteenth except 1981, when it slid to seventeenth in size), and Himachal Pradesh (seventeenth except in 1971 and 1981, when it slid to eighteenth position)—have maintained their ranking over the whole period. Many other states and union territories have formed groups, and there have been changes in the ranks within these groups.

The changing pattern of population distribution among the states is a consequence of differentials in decennial growth rates over time, which can be accounted for partly through differentials in the rates of natural increase and partly through migration. Table 3.8 presents the growth rates of India's population for each zone, state, and union territory during successive time periods.

Population growth, 1901-21

During the first two decades of this century, the northern zone suffered a net loss in population of 1.4 per cent due to various famines and epidemics. Among the remaining four zones, the southern zone experienced the fastest rate of growth, of 11.1 per cent, during the period. Its growth rate was a result of almost uniform growth of the population of its constituent units. In the eastern zone, Assam, Manipur, Nagaland, and Tripura experienced very high population growth rates during 1901-21. The rapid growth in Assam was mainly due to heavy migration in the state's tea plantations.

Population growth, 1921-51

During the 30-year period between 1921 and 1951, the Indian population grew gradually from 251.3 million to 361.1 million, attaining an overall growth rate of 43.7 per cent. The northern, eastern, and southern zones had growth rates close to the national average. The central zone (comprising Madhya Pradesh and Uttar Pradesh) had a comparatively low growth rate of 35.6 per cent, mostly due to a

Table 3.8: Population growth in various zones, states and union territories, 1901-81

<i>Zone/State and Union territory</i>	<i>1901-1921</i>	<i>1921-1951</i>	<i>1951-1981</i>	<i>1951-1961</i>	<i>1961-1971</i>	<i>1971-1981</i>
Northern zone	-1.44	43.87	110.63	23.70	28.56	30.34
Haryana	-7.94	33.31	126.50	33.79	32.23	28.04
Himachal Pradesh	0.41	23.74	77.60	17.87	23.04	22.46
Jammu and Kashmir	13.32	34.21	83.83	9.44	29.65	29.57
Punjab	-5.20	28.07	81.97	21.56	21.70	23.01
Rajasthan	-0.01	55.17	131.53	26.20	27.83	32.36
Chandigarh	-17.45	33.79	1755.08	394.13	114.59	74.95
Delhi	20.36	257.06	255.28	52.44	52.93	54.41
Eastern zone	6.73	43.39	97.10	26.06	25.54	24.69
Assam ^a	40.43	73.69	141.98	4	34.71	36.09
Arunachal Pradesh	—	—	—	—	38.91	34.34
Bihar	2.90	37.88	80.04	19.76	21.33	23.90
Manipur	35.00	50.42	148.20	35.04	37.53	33.65
Meghalaya	24.05	43.39	119.24	27.03	31.50	31.25
Nagaland	56.38	34.11	263.09	14.00	39.88	49.73
Orissa	8.31	31.25	79.38	19.82	25.05	19.72
Sikkim	38.48	68.53	129.21	17.76	29.38	50.55
Tripura	75.65	109.91	222.39	78.71	36.28	32.37
West Bengal	3.15	50.51	107.17	32.80	26.87	21.96
Andaman and Nicobar Islands	9.89	14.34	507.84	105.90	81.17	63.51
Mizoram	-	-	-	-		46.75

Contd. Table 3.8

<i>Zone/State and Union territory</i>	<i>1901-1921</i>	<i>1921-1951</i>	<i>1951-1981</i>	<i>1951-1961</i>	<i>1961-1971</i>	<i>1971-1981</i>
Central zone	0.54	31.61	82.54	18.85	22.49	25.38
Madhya Pradesh	13.71	35.99	99.96	24.17	28.67	25.15
Uttar Pradesh	-4.03	35.45	75.35	16.66	19.78	25.49
Western zone	8.75	54.97	100.07	26.52	28.21	25.37
Gujarat	11.88	59.83	108.83	26.88	29.39	27.21
Maharashtra	7.52	53.49	95.90	23.60	27.45	24.36
Dadra and Nagar Haveli	27.87	33.77	149.63	39.56	27.96	39.78
Goa, Daman and Diu	-1.13	19.00	81.55	5.14	36.88	26.15
Southern zone	11.13	46.26	74.34	16.96	22.82	21.30
Andhra Pradesh	12.35	45.26	71.63	15.65	20.90	22.76
Kerala	21.98	73.66	87.49	24.76	26.29	19.00
Karnataka	12.09	45.03	90.36	11.85	22.30	17.23
Tamil Nadu	12.34	39.26	60.36	11.85	22.30	17.23
Pondicherry	-0.89	29.94	90.43	16.34	27.81	28.07
Lakshdweep	-1.76	54.25	91.29	14.61	31.95	26.49
India	5.42	43.67	89.37	21.52	24.80	24.75

Source: Computed from data in Table 3.6.

a includes Mizoram up to 1961.

higher incidence of mortality and substantial out of the region migration. The western zone, which experienced a growth rate of 55.0 per cent during the period, gained in population through in-migration. This was the period of initial industrial growth in the western zone, particularly in and around Bombay and, to some extent, in erstwhile Baroda state. The industries of the region attracted in-migrants from almost all parts of the country.

Population growth, 1951-81

During the 30-year period since the first census of independent India, the population has almost doubled, increasing from 361.1 million in 1951 to 685.2 million (including Assam) in 1981. The northern zone has experienced the highest growth rate (110.6 per cent), whereas the southern zone, which had higher than national growth rates during 1901-21 and 1921-51, has had the lowest growth rate (74.3 per cent).

During 1951-61, the western zone experienced the highest growth rate (26.5 per cent) and the southern zone the lowest (17.0 per cent). Rates varied from 11.8 per cent in Tamil Nadu to 24.8 per cent in Kerala.

The pattern of population growth changed somewhat during the 1960s as the northern zone recorded the highest growth rate (28.6 per cent) and the central zone the lowest (22.5 per cent). Among the states, Haryana, Jammu and Kashmir and Rajasthan in the northern zone; Assam, Manipur, Meghalaya, Nagaland, Orissa, Sikkim, Tripura and West Bengal in the eastern zone; Madhya Pradesh in the central zone; Gujarat and Maharashtra in the western zone; and Kerala in the southern zone experienced higher-than-average growth rates.

The northern zone continued to lead over the other zones in the rate of population growth during 1971-81. The southern zone was in the last place during this period, all of its states except Karnataka experiencing below-average growth rates. The pattern of population growth during 1971-81 was similar in most states to that during 1961-71, with a few exceptions; for example, growth rates in Kerala, Maharashtra, Orissa, and West Bengal fell below the national average, whereas they rose above the national average in Karnataka and Uttar Pradesh.

Population Density

Population density is defined as the number of persons per square kilometre of any geographical area; i.e.,

$$\text{Population density} = \frac{\text{Total population of the territory}}{\text{Total area of that territory}}$$

It is clear that when the area of a country and its constituent units is fixed over time, population growth will increase the population density. If the population growth is uniform, density will increase uniformly; but a differential pattern of population growth in constituent units will lead to variations in population densities

and would be indicative of an emerging pattern of population re-distribution. Table 3.9 gives the density of population of India for states and union territories from 1901 to 1981.

Table 3.9 Density in various states and union territories, 1901-81

<i>State/Union territory</i>	<i>Density (population per km²)</i>								
	<i>1901</i>	<i>1911</i>	<i>1921</i>	<i>1931</i>	<i>1941</i>	<i>1951</i>	<i>1961</i>	<i>1971</i>	<i>1981</i>
State									
Andhra Pradesh	69	78	78	88	99	113	131	158	194
Assam	42	49	59	71	85	102	138	186	254
Bihar	157	163	162	180	202	223	267	324	402
Gujarat	46	50	52	59	70	83	105	136	173
Haryana	105	94	96	103	119	128	172	227	291
Himachal Pradesh	35	34	35	37	41	43	51	62	76
Jammu and Kashmir	...	...	...	...	...	...	...	...	...
Karnataka	68	71	70	76	85	101	123	153	193
Kerala	165	184	201	245	284	349	435	549	654
Madhya Pradesh	38	44	43	48	54	59	73	94	118
Maharashtra	63	70	68	78	87	104	129	164	204
Manipur	13	16	17	20	23	26	35	48	64
Meghalaya	15	18	19	21	25	27	34	45	59
Nagaland	6	9	10	11	11	13	22	31	47
Orissa	66	73	72	80	88	94	113	141	169
Punjab	150	134	142	159	191	182	221	269	331
Rajasthan	30	32	30	34	41	47	59	75	100
Sikkim	8	12	12	15	17	19	23	30	44
Tamil Nadu	148	161	166	180	202	232	259	317	371

Contd. Table 3.9

State/Union territory	Density (population per km ²)								
	1901	1911	1921	1931	1941	1951	1961	1971	1981
Tripura	17	22	29	36	49	61	109	148	196
Uttar Pradesh	165	164	159	169	192	215	251	300	377
West Bengal	191	203	197	213	292	296	394	499	614
Union territory									
Andaman and Nicobar									
Island	3	3	3	4	4	4	8	14	23
Arunachal Pradesh	...	...	...	...	...	...	4	6	7
Chandigarh	193	162	159	174	198	213	1052	2257	3948
Dadra and Nagar Haveli	49	59	63	78	82	85	118	151	211
Delhi	274	279	329	429	619	1176	1793	2742	4178
Goa, Daman and Diu	133	136	131	142	153	156	164	225	284
Lakshadweep	434	455	426	501	574	657	753	994	1257
Mizoram	4	4	5	6	7	9	13	16	23
Pondicherry	501	523	496	526	579	645	750	959	1228
India @	77	82	81	90	103	117	142	177@	221@

Source : P. Padmanabha, *Census of India, 1981: Provisional Population Totals, Series-I, India, paper of 1981, provisional population table 5.*

Note: @ While working out the density of India, the state of Jammu and Kashmir has been excluded as comparable figures of area and population are not available for that state.

At the national level, the density of population increased from 77 persons per sq. km in 1901 to 221 persons per sq. km, in 1981. The northern zone, with sparsely populated states of Himachal Pradesh, Jammu and Kashmir and Rajasthan had the lowest density of 112.4 persons per sq. km, in 1981 and the density of this zone has remained the lowest throughout the 80 year period. In contrast, the southern zone consistently had the highest density, in comparison to other zones. In fact, Kerala followed by West Bengal, has been the most densely populated state in the country,

with a density of about 654 persons per sq. km, in 1981, although a number of union territories — Chandigarh, Delhi, Lakshadweep, and Pondicherry — have much higher density of population (Table 3.9).

Growth of Urban Population, 1901—81

In Indian censuses, the population has been classified into two broad categories, namely rural and urban. Till the 1951 census, a place was considered as urban by the census organization if it had a Municipality, Cantonment Board, Notified Area Committee, Town Area Committee, etc., and/or a population of 5,000 or more. An interesting feature of the Indian census has been the discretionary power given to the Census Superintendents in each state. They could classify places, as urban if they exhibited certain urban features like high density, economic functions other than agriculture, or if the place was of historical importance, a tourist- or hill-resort, etc.; or could treat a settlement as rural even if it had more than 5,000 persons but its other characteristics were mainly rural.

In the 1961 census, the Census Commissioner of India introduced important changes in the definition of urban areas in order to overcome the problems which arose in earlier censuses due to the arbitrariness of the Superintendents of Census Operations. According to the new definition, all those places which had a Municipal Corporation, Municipal Committee, Cantonment Board, Notified Area Committee, etc., were treated as urban irrespective of their size. In the case of other places, they were treated as urban if: (a) the population was 5,000 or more; (b) the density was not less than 1,000 persons per square mile; and (c) at least three-fourths of the working population was engaged in non-agricultural activities. The later two censuses, i.e. 1971 and 1981, adopted the same definition of urban areas.

It may be noted that the present definition of 'urban' is much more stringent than the definition adopted earlier. Thus, any comparison of data on urbanization for the periods prior to and since 1961 has to be made with great caution. Table 3.10 presents the rural and urban composition of India's population from 1901 onwards. The table shows that at the beginning of this century, about 11 per cent of India's population lived in urban areas. The proportion of urban population did not change appreciably till 1921. It increased gradually, reaching 13.9 per cent by 1941, the last census held before independence. As may be seen from Table 3.10, the post-independence period was characterized by a greater increase in the pace of urbanization, which reached a level of about 24 per cent in 1981.

Another noticeable feature, as revealed by the last two columns of Table 3.10, is that the urban population has been growing at a much faster rate than the rural

Table 3.10: Population of India by rural and urban residence and decadal variation, 1901-81

Year	Population (in million)			Percentage of total population		Decadal growth rate (per cent)	
	Total	Rural	Urban	Rural	Urban	Rural	Urban
1901	238.4	212.5	25.9	89.2	10.8	-	-
1911	252.1	226.1	25.9	89.7	10.3	6.4	0.3
1921	251.3	223.2	28.1	88.8	11.2	-1.3	8.3
1931	279.0	245.4	33.5	88.0	12.0	9.9	19.1
1941	318.7	274.4	44.2	88.1	13.9	11.8	31.9
1951	361.1	298.7	62.4	82.7	17.3	8.8	41.4
1961	439.2	360.2	78.9	82.0	18.0	20.6	26.4
		355.4*	83.7*	80.9*	19.1*	19.0*	34.0*
1971	548.2	439.0	109.1	80.1	19.9	21.8	37.8
1981	685.2	525.5	159.7	76.7	23.3	19.8	46.5

Note: *Population and growth rates adjusted for definition change in the urban places. The figures are obtained by applying the 1951 definition to 1961 census data. See Ashish Bose, *Studies in India's Urbanisation*, New Delhi, Tata McGraw-Hill Publishing Company Ltd., 1974, pp. 37-38.

population. Such a sharp rise in the urban population is possible only when there is significant movement of people from rural to urban areas.

Of particular interest, however, is the changing distribution of India's urban population living in urban agglomerations¹⁵ and different size-classes¹⁶ of cities. Table 3.11 gives the percentage distribution of urban population by size-class of cities/towns, between 1901-1981. It is evident that more than 60 per cent of the total urban population was living in Class I cities in 1981. Another 11.7 per cent lived in cities and urban agglomerations with populations of 50,000 and above but less than 100,000. The population of towns belonging to classes III, IV and V was 14.3, 9.5 and 3.6 per cent respectively and the proportion of urban population living in towns/urban agglomerations having population of less than 5,000 was found to be one-half of one per cent. The concentration of population in Class I cities is largely

attributed to greater job opportunities provided by big cities and, perhaps, better living facilities available there in terms of health, transport, recreation, etc. This has led to heavy congestion in these cities, the growth of slums, environmental pollution and problems of social organization and deviant behaviour.

Table 3.11: Percentage distribution of urban population by size-class of cities/urban agglomeration, 1901-81

Census Year	Size-class					
	I 100,000 and above	II 50,000- 99,999	III 20,000- 49,999	IV 10,000- 19,999	V 5,000- 9,999	VI Less than 5,000
1901	22.9	11.8	16.5	22.1	20.4	6.3
1911	24.2	10.9	17.7	20.5	19.8	6.9
1921	25.3	12.5	16.9	18.9	19.0	7.4
1931	27.4	11.9	18.8	19.0	17.3	5.6
1941	35.4	11.8	17.7	16.3	15.4	3.4
1951	41.8	11.1	16.7	14.0	13.2	3.2
1961	48.4	11.9	18.5	13.0	7.2	1.0
1971	55.8	11.3	16.3	11.3	4.7	0.6
1981	60.4	11.7	14.3	9.5	3.6	0.5

Source: Ashish Bose, *India's Urbanization, 1901-2001*, New Delhi, Tata McGraw-Hill, 1978, p. 136.
For the 1981 census figures, see *Census of India 1981*.

SEX AND AGE COMPOSITION

Sex and age are the most basic of all demographic characteristics and play a vital role in population analysis since they directly affect the incidence of births, deaths and marriages. Migration rates, occupational structure and virtually all other population characteristics may be influenced by the sex-age composition of the population. In addition, the development of a region affects the population composition of that area. The sex-age composition is also the basic demographic determinant of a nation's manpower supply and it influences requirements for

various essential goods and services. The size of the school-going population and school enrolment, the total working force and new entrants into the job market each year, and events such as new-household formation, are all the resultants of the particular sex and age structure of any given population.

The population composition of an area at any given time is the result of past trends in fertility, mortality and migration. It, in turn, influences the current levels of birth and death rates and the size of population at future dates.

Sex Composition

The basic measures used in the study of the sex composition of a population include the sex ratio, the masculinity proportion or femininity ratio. The sex ratio is usually defined as the number of males per 100 females in the relevant population. However, the Indian censuses have defined sex ratio as the number of females per 100 males. The masculinity proportion or ratio is the percentage of males in the total population while femininity ratio refers to the percentage of females in the total population.

Table 3.12 gives the masculinity proportion and the sex ratio of India's population for the census years from 1901 onwards. It may be noted from the table that between 1901 and 1971 there was a continuous and almost uninterrupted increase in the sex ratio of the population of India from 102.9 males per 100 females in 1901 to 107.5 in 1971. There was a slight decline in the sex ratio from 105.8 in 1941 to 105.7 in 1951 probably because of the large scale migration between India and Pakistan (which then included the present Bangladesh) after partition in 1947. According to the results of the 1981 census, though the census counted about 23 million more males than females, the sex ratio registered a decline from the level of 1971.

The higher proportion of males in the total population is a feature not peculiar to India alone, but is characteristic of the population in a large number of developing countries. In most of the developed countries of the world, females outnumber males.

There are four plausible reasons for the high sex ratio in India:

- (a) The sex ratio at birth (number of male babies per 100 female babies) generally varies between 104 and 107. Male predominance at birth is a biological phenomenon and does not vary much from country to country.
- (b) The mortality conditions are more adverse for females than for males.
- (c) There is a greater under-count of females than of males in the Indian census

- (d) More females emigrate than males. There is, however, no evidence of female-selective emigration from India.

Table 3.12: Masculinity proportion and sex ratio-India, 1901-81

<i>Census year</i>	<i>Masculinity* proportion</i>	<i>Sex ratio**</i>
1901	50.7	102.9
1911	50.9	103.8
1921	51.1	104.7
1931	51.3	105.3
1941	51.4	105.8
1951	51.4	105.7
1961	51.5	106.3
1971	51.8	107.5
1981	51.7	106.9

Sources: Computed from *Census of India 1971 and 1981*, Social and Cultural Tables, Series 1, Part-II-C (ii).

Notes: * Number of males per 100 total population

** Number of males per 100 females

From the available material one may conclude that although there has been overall improvement in the health conditions of both males and females, women still get differential treatment from men when it comes to providing them with medical care. This reflects the comparatively low status of women in our society. This is supposed to be the main reason for the sex ratio of the India's population being unfavourable to females.

Age Composition

The data on age at last birthday have been collected in the Indian census right from its inception. However, the collection of accurate age statistics in India, as in many developing countries where a majority of the population is illiterate, has been an

arduous task. The age returns from censuses and surveys are subject to errors arising from a variety of causes such as deliberate mis-statement of age; a tendency to report ages ending in certain preferred digits and to avoid others; exaggeration of age at the older ages; carelessness in reporting age; and ignorance of age. In cases of ignorance of age, it is usually estimated by the respondent and the enumerator. Because of this, the age reporting in the Indian census (and so also in most of the demographic sample surveys) suffers from pronounced heapings at certain preferred terminal digits like zero and five and, to a lesser extent, at some of the even digits like two, four and eight. Hence, there are deficits at most of the odd digits.

Table 3.13 presents the percentage of the population of India by sex and age in the conventional quinary age groups for 1971 and 1981. The sex-age data for 1971 and 1981 censuses are based on a 10 per cent rural and 20 per cent urban sample.

Table 3.13: Percentage distribution of male and female population by five-year age group-India, 1971 and 1981

Age group	1971		1981	
	Males	Females	Males	Females
0-4	14.2	14.9	12.28	12.85
5-9	14.9	15.1	14.03	14.13
10-14	12.8	12.2	13.16	12.65
15-19	8.9	8.4	9.89	9.37
20-24	7.6	8.2	8.43	8.82
25-29	7.2	7.8	7.49	7.77
30-34	6.4	6.8	6.27	6.47
35-39	6.1	5.9	5.79	5.90
40-44	5.3	5.0	5.24	5.03
45-49	4.4	3.9	4.47	4.31
50-54	3.9	3.6	4.01	3.61
55-59	2.4	2.3	2.47	2.46
60-64	2.6	2.6	2.73	2.73
65-69	1.3	1.3	1.39	1.47
70 and above	2.0	2.1	2.28	2.38
All ages	100.0	100.0	100.00	100.00

Sources: Computed from *Census of India 1971 and 1981 Social and Cultural Tables, Series I, PART-II-C (ii)*.

It may be noted from Table 3.13 that between 1971 and 1981 the proportion of the population in the age group 0-4 declined from 14.2 per cent to 12.3 per cent for males and from 14.9 to 12.9 per cent for females, thus indicating a decline in fertility during the two decades. However, during the period 1971-81, there was significant increase in the proportion of those in the most fertile age groups between 20 to 39. The proportion of males in this age group increased from 27.3 to 28.0 per cent while for females the increase was from 28.7 to 29.0 per cent.

Distribution by broad age groups

The age compositions of different populations are usually compared in terms of three broad age groups: children below the working age, persons in the working age, and old persons above the working age. These age groups are: below 15 years, 15 to 59 years and 60 years and above. The percentage distribution of the total population in these broad age groups as well as the index of aging and dependency ratios for all India since 1901 are given in Table 3.14. It is noteworthy that the proportion of the population in all the three broad age groups remained more or less unchanged until 1951. However, during the two subsequent decades there was a substantial increase in the proportion of the population in the younger age group (0-14 years) and a slight increase in the proportion of the old age group (60 years and above). Consequently, the overall dependency ratio recorded an increase to an all-time high of 92.3 in 1971. Thus, India suffers from a heavy burden of dependency, particularly at young ages. It must, however, be noted that the true dependency load (ratio of non-workers to workers in the population) in India is much higher than is indicated by the conventional dependency ratio, because not all persons of the working age group are actually at work.

A heavy dependency load tends to reduce savings and investments and decelerates the rate of economic development and social advancement of a country, as a large proportion of scarce resources are diverted towards consumption. In case of developing countries where fertility is high, an increasingly large number of persons continue to enter the working age group, increasing the number of unemployed persons. Further, certain social and economic processes, such as family formations and house purchase, job-seeking, retirement and savings, migrations and mobility, are closely related to the age composition of a population. The index of aging from 1901 to 1981 are given in Table 3.14. As is evident from this table, the index has shown fluctuations after the year 1921 and hence no definite trend in this index is ascertainable. However, a slight increase in its value can be noticed between 1971 and 1981 which may, perhaps, be due to the combined effect of the decline in fertility and mortality during the last decade.

Table 3.14: Percentage distribution of total population by broad age group, Index of Aging and Dependency Ratio- India, 1901-81

Census year	Percentage distribution by age group				Index of Aging ¹	Dependency Ratio		
	0-14	15-59	60+	All ages		Young ²	Old ³	Overall ⁴
1901	38.60	56.35	5.05	100.00	13.08	68.50	8.96	77.46
1911	38.45	56.40	5.15	100.00	13.39	68.17	9.13	77.30
1921	39.20	55.55	5.25	100.00	13.39	70.57	9.45	80.02
1931	40.00	55.95	4.05	100.00	10.13	71.49	7.24	78.73
1941	38.25	56.85	4.90	100.00	12.81	67.28	8.62	75.90
1951	37.50	56.85	5.65	100.00	15.07	65.96	9.94	75.90
1961	41.00	53.36	5.64	100.00	13.74	76.84	10.55	87.39
1971	42.02	52.01	5.97	100.00	14.21	80.97	11.48	92.27
1981	39.55	53.96	6.49	100.00	16.41	73.29	12.02	85.31

Source: Censuses of India, 1901-81

- Notes: ¹ Index of aging = $(\text{Percentage of population aged 60 and over} / \text{percentage of population aged 0-14}) * 100$
- ² Young dependency ratio = $(\text{Percentage of population aged 0-14} / \text{percentage of population aged 15-59}) * 100$
- ³ Old dependency ratio = $(\text{Percentage of population aged 60 and over} / \text{percentage of population aged 15-59}) * 100$
- ⁴ Overall dependency = Young dependency ratio + Old dependency ratio

Age structure of populations of selected developing and developed countries of the world

Figure 3.1 gives the sex-age pyramids of two developing countries, India and the Philippines, and of two developed countries, Sweden and the USA. It may be seen that the pyramids of these two sets of countries have different shapes. The pyramids of the two developing countries, India and the Philippines have broad based and

steeply sloping sides, indicating a large proportion of children and young persons and a small proportion of old people in the population. On the contrary, the population pyramids of the two developed countries, Sweden and the USA, are almost rectangular in shape, with a slight sloping at the older ages. These population pyramids indicate lower proportion of children and a higher proportion of adults and the elderly persons in the population. The populations which have a higher proportion of children and young persons are known as 'young' populations whereas those with lower proportion of children and a higher proportion of old people are called 'old' populations.

COMPONENTS OF POPULATION CHANGE

There are three basic components of population change, viz. fertility, mortality, and migration, which determine the size and sex-age composition of the population of a region. A separate study of each of the three components of population change will give a better insight into the dynamics of population.

Fertility

Meaning and definition of some important terms

The term *fertility* refers to a certain phenomenon connected with human child-bearing or reproduction. Often, the term *nativity* is also used instead of fertility. These terms refer to the frequency of occurrence of births, or more specifically live births or the births of live-born children. A live birth is characterized by the evidence of life, such as respiration, movement of voluntary muscles or heartbeat of the child after complete expulsion or extraction.

Fecundity is distinguished from the term fertility. While the former refers to the capacity of a woman to deliver a live birth, the latter means the actual performance rather than the capacity. Fecundity is thus the realization of the capacity to deliver.

Other important terms frequently used in fertility analysis include *family size*, *birth order*, *parity* and *infecundity* or *sterility*. *Family size* means the number of children a woman or a couple has borne at a point of time. The completed family size gives the total number of children borne by a woman upto the end of her *reproductive period*. The reproductive period, also called the child-bearing period, begins at puberty (normally at 14 years of age when a female starts menstruating, i.e. menarche) and ends at the age of 45 or 50 years when the woman stops menstruating i.e. reaches menopause.

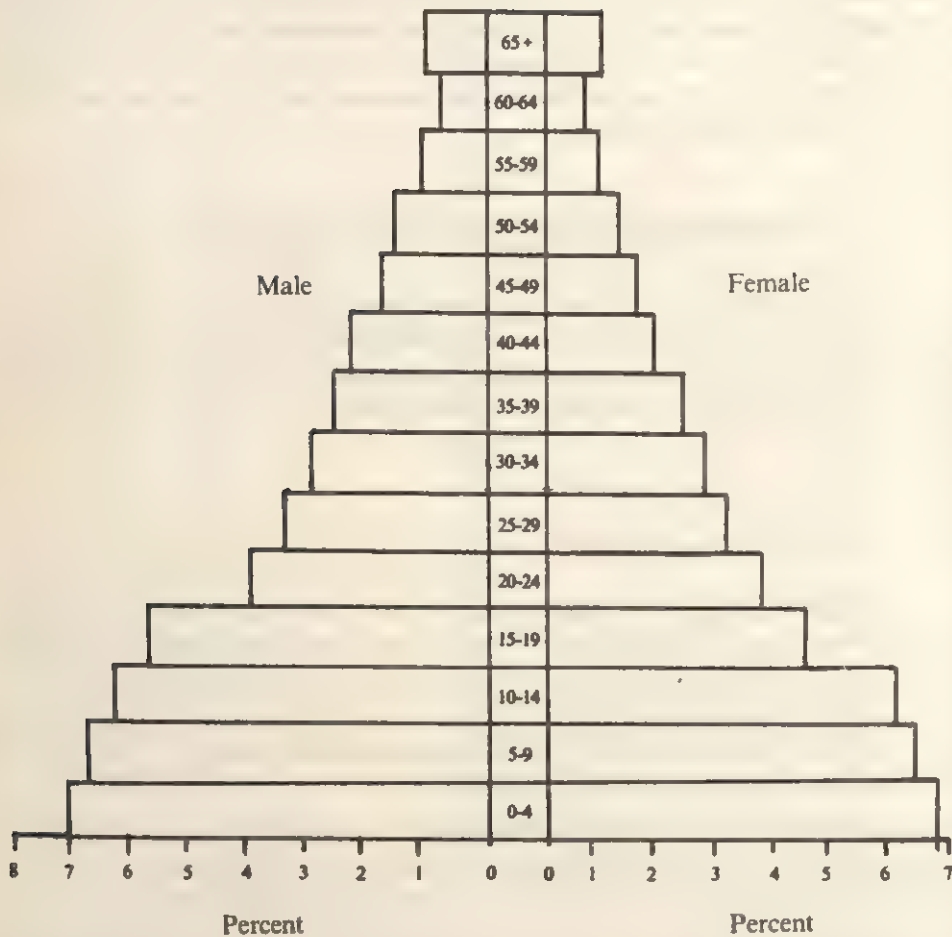


Fig. 3.1 (a) AGE-SEX PYRAMID OF INDIA, 1981

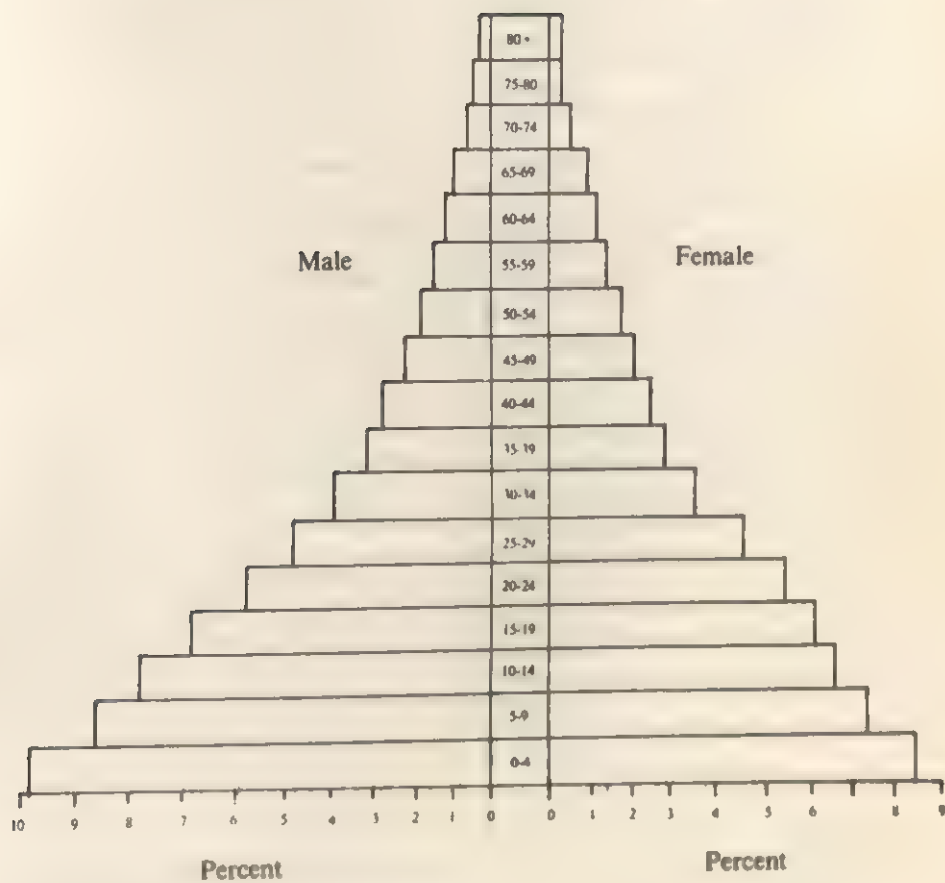


Fig. 3.1 (b) AGE-SEX PYRAMID OF PHILIPPINES, 1980

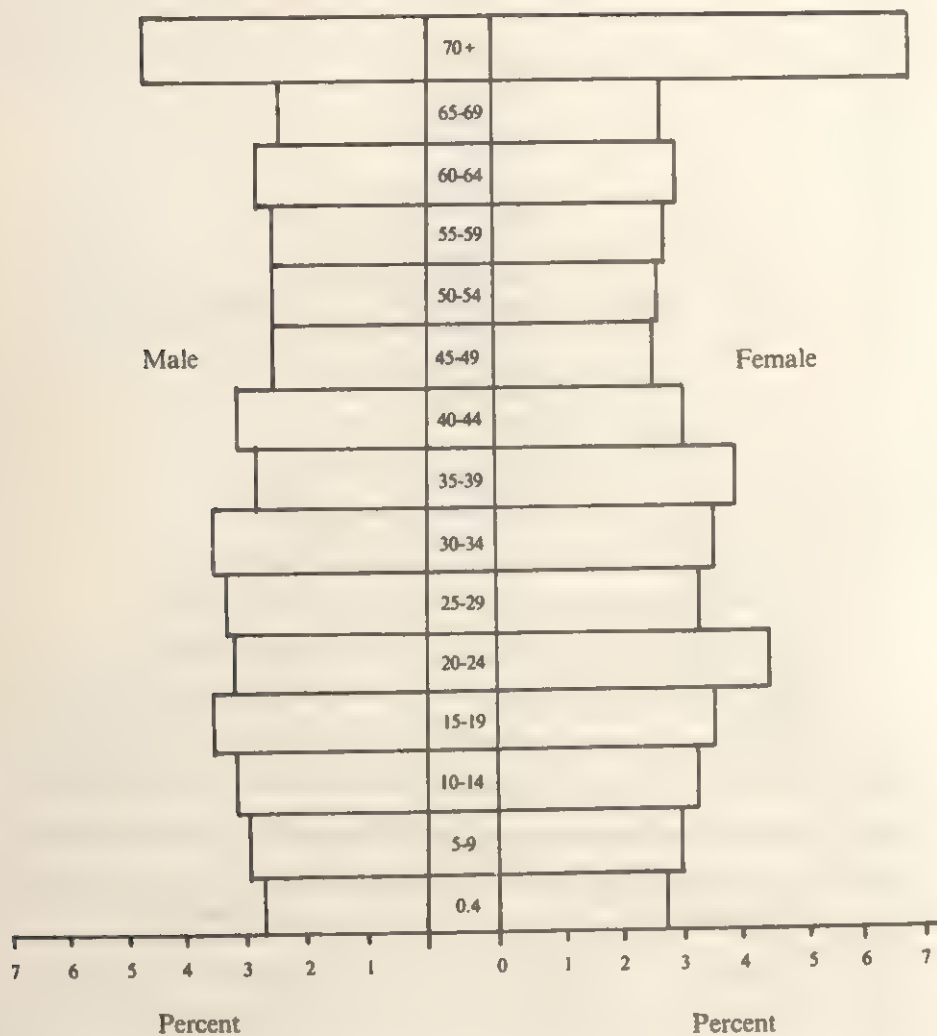


Fig. 3.1 (c) AGE-SEX PYRAMID OF SWEDEN, 1981

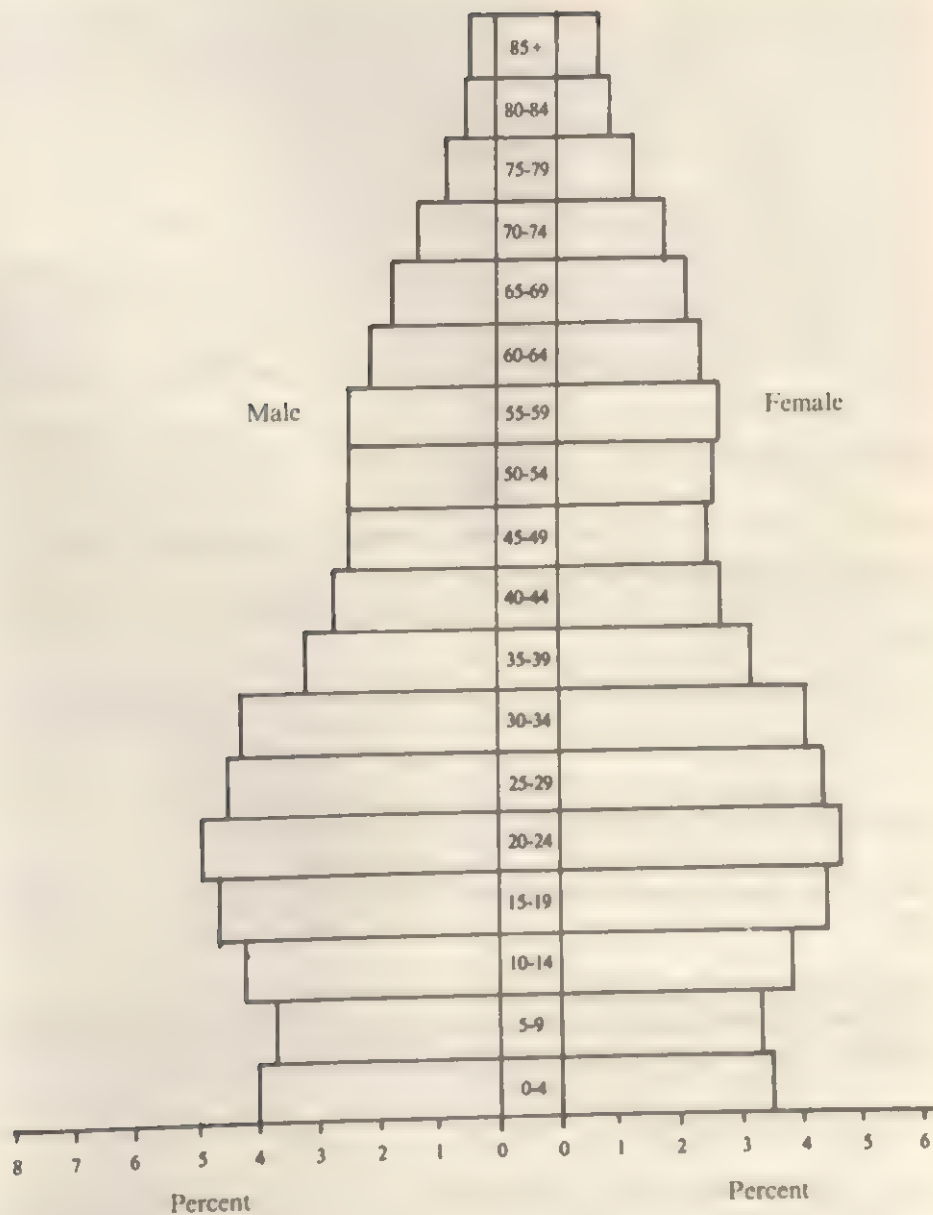


Fig. 3.1 (d) AGE-SEX PYRAMID OF UNITED STATES, 1981

Birth order refers to the order of live birth to a woman, classified according to their order or rank; e.g. first order birth, second order birth, etc., and is usually determined by considering all previous births to the mother. Women are also classified by *parity* usually on the basis of the number of children born alive. For example, a woman who has not borne any live children is called a zero-parity woman; a one-parity woman has borne one child but no more, and so on. Thus, while the birth order refers to the child, parity refers to the mother.

The term *infecundity* or *sterility* refers to the lack of capacity of a man or a woman or a couple to produce a live child. A woman who has never been able to give birth to a live child is called a *primarily sterile* woman. *Secondary sterility*, on the other hand, arises when a woman stops producing children after giving one or more live births.

Sources Of Data For Fertility Analysis

The basic data for fertility analysis come from the following three sources:

- (i) The National Periodic Censuses;
- (ii) Vital Registration or the Civil Registration System; and
- (iii) Sample Surveys.

The type of data available from each of these sources may be summarized as follows:

Census: (a) census age distribution; (b) the number of children ever born to a woman; and (c) the number of births during the last 12 months.

Vital registration system: The number of births registered usually in one calendar year.

Sample surveys: (a) the number of children ever born; (b) the number of births during last 12 months; and (c) birth histories giving details about the outcome of the pregnancy, interval between two successive births, etc.

Basic measures of fertility

Using the data obtained from the three different sources, namely the census, vital registration system and sample surveys, the following measures of fertility can be computed.

Crude Birth Rate (CBR): The crude birth rate is defined as the ratio of total number of live births (B) in a calendar year in a particular geographical area to the total mid-year population (P) of that area, the ratio, frequently multiplied by 1,000 ($= K$), gives a crude birth rate per thousand population.

$$CBR = (B/P) * K$$

General fertility rate (GFR): This is a ratio of the total number of live births (B) during a calendar year in a given geographical area to the total number of women (mid-year population) of child-bearing ages (F) (either 15-44 or 15-49 years) in that area.

$$GFR = (B/F_{15-44}) * K \text{ or } GFR = (B/F_{15-49}) * K$$

Age-specific fertility rate (ASFR): This is the number of live births per woman of a specific age group (usually 5-year age groups from 15-19 to either 40-44 or 45-49 years) of the population of a given geographical area during a given year.

$$ASFR_i = (B_i / F_i) * K$$

For $K = 1,000$ the age-specific marital fertility rate ($ASMFR$) relates to number of births per 1,000 married women.

The $ASFR$ s and $ASMFR$ s may also be computed for single year of age. The pattern of these rates gives useful information on the fertility behaviour of the population. The patterns of both the $ASFR$ s and $ASMFR$ s vary among different populations and may change in course of time.

Total fertility rate (TFR): This is defined as the sum of the age-specific fertility rates of women by single year of age from 15 to 44 years (or 15 to 49 years) and is expressed per woman. If the $ASFR$ s are given for 5-year age groups, the sum is multiplied by 5 to yield TFR .

$$TFR = 5 * \sum ASFR_i$$

This represents the average number of children that would be born to a woman if she is subjected to the given schedule of $ASFR$ s and does not die before the end of her reproductive period. The sum of $ASMFR$ s gives the total marital fertility rate ($TMFR$), which is the average number of children born to a married woman.

Gross reproduction rate (GRR): This is the sum of $ASFR$ s based on female births only. For computation of GRR , total fertility rate (TFR) is multiplied by the proportion of female births in the population ($ASFRF$).

$$GRR = 5 * \sum ASFRF_i$$

This represents the average number of daughters born to a woman if she is subjected to the given schedule of ASFRs and does not die before the end of the reproductive period. For example, if *GRR* of a population is 2.45, it implies that if 100 women follow the given schedule of the *ASFRs* they will be replaced by 245 daughters assuming of course, that no women dies during her reproductive life. Thus, *GRR* is a replacement index indicating potential fertility of the population.

Net reproduction rate (NRR): This is same as gross reproduction rate (*GRR*) after mortality has been taken into account. The *NRR* gives the number of daughters ever born to a hypothetical cohort of women according to given schedules of fertility, fixed age-specific mortality rates (defined in the next section) up to the end of their child-bearing period.

$$NRR = \sum_i (ASFR_i) * (5Lx/l_0)$$

Where $5Lx$ is the life-table population (which is also known as person-years lived) in the ages x to $x+5$ and l_0 is the radix of the life-table giving the size of the birth cohort. Thus *NRR* measures the extent to which a cohort of newly born girls would replace their mothers under the given schedules of fertility and mortality. The level of fertility (expressed in terms of either *TFR* or *GRR*) corresponding to an *NRR* of 1.0 is often referred to as 'fertility at the replacement level'. In other words, *NRR* = 1.0 implies that given the current fertility and mortality schedules, a woman is replaced, on an average, by one daughter during her entire reproductive period.

Child-woman ratio (CWR): This is the ratio of the number of children under 5 years of age to the number of women in the reproductive age group. The denominator is the number of women in the age group 15 to 44 years (or 15 to 49 years). *CWR* is generally used as a fertility index when reliable birth statistics are not available. Thus, the child-women ratio is calculated as:

$$CWR = (P_{0-4} / F_{15-44}) * K \text{ or } CWR = (P_{0-4} / F_{15-49}) * K$$

This measure can be used to compare fertility performance of different groups of people purely on the basis of census data. These comparisons are valid only under the assumption that the infant and child mortality is the same in different groups. There are other indirect measures of fertility which can be obtained from population census data. However, because of their complicated nature, they have not been discussed here.

Crude birth rates in India

The crude birth rates (*CBRs*) for all India obtained from the census data (using the

indirect method of estimation) are presented in Table 3.15. The *CBR* in the country has long remained at a high level. The sudden slump in the figure for the decade 1941-51 is because of the difference in the methodology adopted for that decade for estimating age structure which, in turn, affected the estimate of the birth rate. The data, however, indicate a clear declining trend in the *CBR* in the Indian population.

Table 3.15 : Estimated crude birth rates-India, 1901-81

<i>Decade</i>	<i>CBR per 1000 population</i>
1901-11	49.2
1911-21	48.1
1921-31	46.4
1931-41	45.2
1941-51	38.9
1951-61	41.7
1961-71	41.2
1971-81 **	37.2

Source: Registrar General, India

* By reverse survival method

** Provisional

State-wise crude birth rates: Large variations have been observed in the *CBR* among the states and union territories in India. The national *CBR* has varied from 36.9 in 1971 to 33.0 in 1977. States like Gujarat, Madhya Pradesh, Rajasthan and Uttar Pradesh have had *CBRs* generally above the national average in the past. Actually, the *CBR* in Uttar Pradesh has remained above 40 per 1000 population till 1978. In contrast, the *CBRs* in Kerala, Karnataka, Tamil Nadu, Andhra Pradesh and Maharashtra have been below the national average in the past. Among the major states, Kerala is the only state which has been able to achieve a *CBR* of around 25 per 1000 population in 1978.

Rural-urban differentials in crude birth rates: The *CBRs* in the urban areas are found to be much lower than those in the rural areas. At the national level, the difference between rural and urban *CBRs* is of about 7 points. The states, in which

overall CBRs are high, also have large differences in their rural and urban CBRs whereas this difference is found to be much smaller in the states with comparatively low CBRs.

Socio-economic variables affecting fertility: Various socio-economic variables are believed to affect fertility. Among them a few important variables are (i) education; (ii) income; (iii) occupation; (iv) age at marriage; and (v) variables of the social action system.

(i) *Education and fertility:* The education of both wife and husband is believed to be an important factor in determining the level of fertility. Table 3.16 gives the average number of children born to women who had completed the child-bearing span at the time of the survey.

Table 3.16: Average number of children born alive per couple with the age of wife above 47 years, by educational level of husband/wife (urban areas only)

<i>Educational level</i>	<i>Husband</i>	<i>Wife</i>
Illiterate	7.04	6.65
Below primary	6.19	6.90
Primary	6.50	6.57
Middle	6.63	5.04
Matric	6.56	4.58
Inter and above	5.54	2.01*

* Sample size was below 20.

The number of children born alive to those women who were 'illiterate', 'below primary', or 'primary' level was 6.6 or slightly more. A clear reduction in the number of children born to a woman is seen only when her educational level goes up beyond the 'middle' level. The educational attainment of the husband is found to have little effect on his wife's fertility. A number of empirical studies have confirmed these findings.

(ii) *Income and fertility:* A number of studies on fertility have indicated that the number of children born per couple decreases with the increase in the per capita

monthly income or expenditure of the households. This happens in both rural and urban households.

A high per capita income of the household implies that the children and mother have better nourishment in the family. It also implies that medical care can be provided more easily and more often in case of sickness of the child. This, in turn, prevents infant and childhood mortality. Once the couple is sure about the survival of those children who are already born in the family, they may no longer attempt to have more children. Again, in the higher income groups, the son normally does not follow the occupation of the father, and hence, for a long time, the child remains a 'consuming' unit instead of becoming a 'producing' unit at the very young ages of 8 to 14 years.

(iii) *Occupation and fertility*: A number of studies have revealed that the fertility of those couples where the husband is in a white-collar job, generally in the professional category or as manager, supervisor, administrative head, etc., of a firm or organization, is much lower than the fertility of those couples where the husband is engaged in a blue-collar job as an unskilled or skilled labourer or as a production process worker. In case the wife is employed in a white-collar job, her job itself forces her to have fewer children which means a lower fertility for her than for women who are either not working or who are working in agriculture or in households as maid servants, as frequent child-bearing does not adversely affect their work.

(iv) *Age at marriage and fertility*: In a social system like ours, where parents have the responsibility of getting their daughters married, marriage becomes almost universal. It is more so because pre-marital sexual relations are frowned upon by society. If marriage takes place at an early age, this leads to higher fertility of women, since they start reproducing at a comparatively young age. But if marriage is delayed by a few years, especially if it takes place after the girl has attained the age of 20 years, it cuts off the early fertility and also affects (through certain biological processes) the fertility performance in the later years of the reproductive span. Hence, the fertility of women who marry late, especially after attaining the age of 20 years, is lower than that of women who marry at younger ages.

In India, female age at marriage is one of the lowest in the world. Child marriages are still prevalent in the country, particularly in rural areas. This may be one of the reasons for high fertility in India. However, the average age at marriage of females in India is increasing. The mean age at marriage of females has recorded an increase from 13.2 years in 1901-11 to 18.3 years in 1971-81.

Variables of the social action system affecting fertility: We have seen how the variables of the social aggregate system, such as literacy and educational attainment, participation in economic activity, the nature of the economic activity of the husband and wife, and the income of the family, affect fertility. Certain variables of the 'social action system' also affect the fertility performance of women in Indian society.

In our society, the bearing of children is considered to be the most important function of a newly married bride. Her own status in her new home basically depends on the success in her reproductive career, and particularly, her ability to give birth to male children. The spacing of children in the family is largely determined by traditional and family norms regulating the duration of breast-feeding of the new born, post-partum taboos, abstinence from intercourse on certain specified days and certain other practices. In Indian society, the couple is not really free to chart its own reproductive career, which is the concern of the extended family, and perhaps even of the community. The woman who postpones having children, especially when she has no sons, will surely be the object of criticism, as will the one who conceives in quick succession ignoring post-partum taboos, or who continues to have children even when grand children have started being born. However, different segments of our village society have different norms and practices in regulating the fertility behaviour.

The existence of certain types of health institutions in rural areas, like Primary Health Centres (PHCs) which provide maternity and child-care services, help in reducing infant mortality. This, it is believed, in itself has a secular effect on fertility. A number of studies have confirmed that if a woman loses a child in its infancy, there is a tendency to overcome the shock of this loss by having another pregnancy in quick succession. Thus, if the incidence of infant mortality comes down, one may expect that there will be fewer replacements and hence fertility is expected to record a decline.

Similarly, it is believed that the availability of educational institutions, particularly for females, helps in reducing the CBR. The education of girls raises their age at marriage and helps them understand the importance of personal hygiene and nutrition and of seeking medical care in case of the illness of anyone in the family. All these factors help in reducing fertility. In a similar way, the existence of certain types of welfare institutions in our society influence fertility in one way or the other, more often bringing about a reduction in it.

Mortality

Meaning and definition of some important terms

The study of mortality deals with the effect of death on population. The general terms, *mortality rate* or *death rate*, include all the rates which measure the frequency of deaths. According to international definition *death* is defined as permanent disappearance of all evidences of life at any time after birth has taken place. However, the term *foetal death* is formally defined as a death prior to the complete expulsion or extraction from its mother's womb as a result of conception, irrespective of the duration of pregnancy. Note that foetal death includes *stillbirths*, *miscarriages* and *abortions* as the outcome of a pregnancy. According to a United Nations definition, a *stillbirth* refers to foetal death after 28 completed weeks or more of gestation. The term *miscarriage* is popularly employed to refer to spontaneous or accidental termination of pregnancy in the early stages. The term *abortion* is generally used to refer to induced early foetal death.

Sources of death statistics

In developed countries, the basic death statistics for mortality analysis are usually obtained through civil registration systems of vital events. The analysis of death statistics collected from the vital registration system depends on the availability of appropriate population data from the census survey.

In developing countries where the vital registration system is weak, the principal alternative sources to collect mortality data are : (i) national censuses; and (ii) national sample surveys. Direct data on deaths are not generally collected in a census, but of late, some indirect techniques have been used to estimate the level of mortality from the age distributions of persons covered by the census or survey. Another important source for death statistics is the *Demographic Year Book* (DYB) published by the United Nations, which provides statistics relating to the number of deaths and death rates, deaths by age and sex, infant deaths, infant mortality rates, causes of deaths, etc., for various countries of the world.

Basic measures of mortality

Mortality cannot be measured by a single indicator. The risk of death can be measured in several aspects. Various measures have been proposed for the analysis of mortality. Some of the measures generally employed for studying mortality conditions of a population are described.

Crude death rate (CDR): It is defined as the ratio of the total number of deaths (D) in a year to the *person-years* lived in a population (P) during a calendar year.

Since it is difficult to get the *person-years* lived in a population, the mid-year population is taken as an approximation of the total number of *person-years* lived in a calendar year to the whole population.

CDR = Number of deaths which occurred in a population of a given geographical area during a calendar year

Mid-year total population of the given geographical area during the same calendar year.

Thus, with $K = 1000$, CDR gives the number of deaths per 1000 population per year.

$$CDR = (D/P) * K$$

The CDR is a very crude measure of the level of mortality since it is affected by the age composition of the population. It is pertinent to note that mortality rates are quite different in infancy, childhood, adulthood, middle and old ages. Thus, the CDR gives only a general indication of the level of mortality. To refine this measure, various types of specific death rates have been suggested in the literature. Specific death rates refer to specific categories of deaths and population. These categories may be sub-divisions of the population, or deaths according to sex, age, occupation, education, ethnicity, etc.

Age-specific death rates (ASDR): This is the number of deaths in a specific age group of the population of a given geographical area divided by the mid-year total population in that age group of the given geographical area during the same calendar year.

$$ASDR_i = (D_i/P_i) * K$$

We may note that ASDRs give detailed information regarding mortality conditions of a population. For comparison of the mortality situations at different stages of human life, e.g. at infancy, childhood, working or reproductive ages, and old ages, the ASDRs are the best of all the mortality indices. This is because, unlike the CDR, ASDRs are not affected by the change in the age structure of the population.

Age-specific mortality rates (ASMR): This gives the probability of death to a person in a specific age group during a one-year period.

Expectation of life at birth (e^{00}) This gives the average number of years a new born child is expected to live if he/she experiences the given schedule of mortality.

The reciprocal of e^{∞}_x is called the life table death rate. Expectation of life at age x (e^{∞}_x), gives the average number of years that a person is expected to live when he attains age x exactly.

Infant mortality rate (IMR): The conventional measure of infant mortality rate (IMR) is defined as the number of deaths of infants (death during the first year of life) per 1,000 live births occurring in a community (or population) in a given year.

It may be noted that the IMR as defined above, does not represent the proportion of babies born in a year and those who die in the same year before completing one year of life. In fact, the numerator and the denominator do not belong to the same universe, i.e., some of the infant deaths in a year included in the numerator belong to the births which occurred in the previous year. When the numerator and the denominator belong to the same year, the resulting rate is known as the *adjusted Infant Mortality Rate (IMR)*.

Life table: A life table presents the mortality history of a hypothetical group or cohort of people as it diminishes gradually by deaths. The cohort originates from some fixed number of births (i.e. P_0 , called the radix of the life table and which is generally taken as 100,000) and loses certain proportion at each age. Excepting the first few years of life, the deaths are evenly distributed between one birthday and the next. Life tables can be categorised on the basis of the reference year, into two types, namely (i) current life table; and (ii) cohort, or generation life table.

The current life table is based on the mortality experience over a short period of time, such as one year, three years, or the intercensal period, in which mortality remained the same. Generally, the death statistics used for a current life table relate to a period of one to three years and the population data used relate to the middle of that period. Therefore, it represents a combined mortality experience by age of the population in a particular short period of time.

On the other hand, **the cohort life table** is based on the mortality rates experienced by a particular birth cohort, i.e. one in which all the persons of the hypothetical population were born in the same year. In the cohort life tables, the mortality experience of the persons in the cohort would be observed from their birth through each consecutive age in successive calendar years until all of them die. If the mortality situation in a given population remains the same over a long period of time, the current and cohort life tables will be exactly the same.

There could be two types of life tables on the basis of the length of the age-interval in which the data are presented: (i) the complete life table; and (ii) the abridged life table.

A *complete life table* contains data for each single year of age from birth to the last plausible year in the age-span of human beings, whereas the *abridged life table* admits data by intervals of 5 or 10 years of age. Abridged life tables do not give the life table functions for each single-year age interval. For all practical purposes however, life table functions are generally required for every fifth or tenth age of the corresponding age interval. Also, more often than not, the time and skill needed to prepare a complete life table may not be readily available. For these reasons, abridged life tables are generally computed and a number of methods have been developed for their computation.

Levels and trends of mortality in India

Mortality has played a very significant role in the acceleration of population growth in India, particularly during the last two decades, and will continue to play this important role for many more years to come. The changes in the level of mortality through time have been analysed in this section, separately under the three indices of the level of mortality, namely (i) crude death rate; (ii) expectation of life at birth; and (iii) infant and child mortality.

Crude death rate: Table 3.17 gives the crude death rates for India from the decade 1901-10 to the decade 1971-80. It is evident that the death rate was very high and was fluctuating widely as late as the first quarter of the present century. Since the 1930s, however, the situation started improving gradually and the crude death rates decreased steadily to a level of 15 deaths per thousand population during the decade 1971-80. The pace of decline in the death rates was relatively rapid since 1951.

Table 3.17: Crude death rates-India, 1901-10 to 1971-80

Decade	1901-1910	1911-1920	1921-1930	1931-1940	1941-1950	1951-1960	1961-1970	1971-1980*
Death rates (per 1,000 population)	42.6	47.2	36.3	31.2	27.4	22.8	19.0	15.0

Source: Government of India, Family Welfare Programme in India, *Year Book-1986-87*, New Delhi, Ministry of Health and Family Welfare, Department of Family Welfare, January 1988, p. 77.

* Provisional

Expectation of life at birth: The expectation of life at birth (e^0) is an indicator of the general level of mortality in a population and is widely used for comparative analysis of mortality situations in different populations. Table 3.18 gives the *expectation of life at birth* separately for both the sexes for all India since 1901. It may be observed from the table that the expectation of life at birth for the decade 1971-80 has increased to more than twice the figure for the decade 1901-10, indicating that the mortality level has declined substantially. Since 1910, the gains in the expectation of life at birth for males and females were, on an average, 0.34 years and 0.30 years per year respectively. The figures reveal that prior to 1941, the annual increase in the *expectation of life at birth* was quite slow, being on an average 0.24 years in case of males and 0.20 years in case of females. However, the annual average increase in the expectation of life at birth, in the case of both males and females, gained momentum after 1941, being 0.46 years and 0.43 years per year respectively. But this increase in (e^0) was still lower than the world's average: an increase of 0.5 years in (e^0) per year.

Table 3.18: Expectation of life at birth-India, 1901-10 to 1971-80

Decade	Expectation of life at birth (e^0)		
	Males	Females	Both sexes (combined)
1901-1910	22.6	23.3	22.9
1911-1920	19.4	20.9	20.1
1921-1930	26.9	26.6	26.8
1931-1940	32.1	31.4	31.8
1941-1950	32.4	31.7	32.1
1951-1960	41.9	40.6	41.3
1961-1970	46.4	44.7	45.6
1971-1980	50.9*	50.0*	50.5*
	(54.1)	(54.7)	(54.4)

Source: Same as for table 4.17

*Based on Sample Registration System; the figures given in parentheses relate to the year, 1980.

It may also be noted that the pace of improvement in female mortality in India had always been lower than that of males during the previous decades.

Infant and Child Mortality: The most useful indicators reflecting the general health conditions are infant and child mortality rates. Both are rather sensitive to the general conditions of life, environmental sanitation and standards of living. The available statistics of infant mortality rates (IMR) for all India indicate that the rates had been fluctuating at a higher level till 1941, and that it was only after this period that the IMR dropped below 200¹⁷. Kumarappa who reviewed the situation in 1941, observed that nearly 30 per cent of the new born babies died during the first year of their life. In 1930, infant mortality rates in the big cities of Bombay, Calcutta, Madras and Delhi were 298, 268, 246, and 199 respectively¹⁸. Table 3.19 presents the infant mortality rates by sex and rural-urban residence for all-India from 1972 to 1983.

Table 3.19: Infant Mortality rates by sex and rural-urban residence — all-India, 1972-83

Year	Rural			Urban			Total		
	M	F	Both sexes (Combined)	M	F	Both Sexes (Combined)	M	F	Both Sexes (Combined)
1	2	3	4	5	6	7	8	9	10
1972	141	161	150	85	85	85	132	148	139
1973	141	144	143	88	90	89	132	135	134
1976	133	146	139	78	82	80	124	134	129
1977	134	149	142	69	65	67	124	135	130
1978	132	143	137	74	75	74	123	131	127
1983	113	114	114	69	63	66	105	105	105

Source: Registrar General of India-Sample Registration System.

As is evident from the table, the IMR has recorded a decline, though marginally, in case of both males and females during the period 1972 to 1983. This decline is mainly due to provision of public health facilities such as nutrition programmes to fight malnutrition in pregnant mothers and immunization programmes. It may, however, be noted that the present level of IMR in the country is still very high as compared to the rates observed in developed countries of the world. According to Kumarappa (1941), some of the most important economic and social causes which contribute to

infant and maternal mortality are poverty, ignorance, bad housing, venereal diseases, early marriage and physiological physical, and emotional immaturity of the mother, untrained *dais* care or midwives, employment of mothers during pregnancy and the neglect of children. He laid stress on the importance of setting up of a large number of pre-natal and child health centres in rural and urban India, free distribution of simple literature on pre-natal care and child care, and the education of mothers in hygiene and nutrition.

Mortality among infants is governed by endogenic and exogenic factors. The endogenic factors include genetic causes which affect the growth of organisms, damage during gestation, and the risks of delivery. These factors continue to operate during the neo-natal period which is taken as the first 28 days after birth. The new born is simultaneously exposed to exogenic factors as well, such as infections, respiratory and digestive disorders and faulty care of the child immediately after expulsion from the womb¹⁹. It is perhaps needless to emphasize that the mortality caused by such factors can be controlled by improving hygienic and environmental conditions in the country.

The data on child mortality in India are either scanty or are not available. The only alternative source which could provide information for examining the trends in child mortality in the country are the national life tables constructed by actuaries. In fact, the life tables prepared from census age returns describe the mortality situations during the inter-censal periods.

The estimates of child mortality obtained from the national life tables for the decades 1941-51 and 1951-61 reveal that about 600 children out of 1,000 live-births used to survive upto the exact age of 15 during 1941-51; and the number of survivors rose to 735 and 758 children per 1,000 live-births during the next two decades, viz., 1951-61 and 1961-71, respectively. This shows that the increase in the number of surviving children was about 22.5 per cent over the decades 1941-51 and 1951-61, whereas gain in the percentage of the survivors during 1961-71 over the previous decade was only 2.4 per cent²⁰. These figures reveal that the reduction in child mortality was highest during the first two five-year plan periods, when preventive health programmes were initiated and implemented. It seems that these programmes had a greater impact on the reduction in child mortality prior to 1961.

Table 3.20 presents the estimates of child mortality obtained from the official life tables available for the three decades, 1941-51 to 1961-71. It may be observed from the tables that the age-specific death rates for the decade 1951-61, for both males and females had recorded steep decline during the period when compared with the respective estimates for the decade 1941-51. The percentage decline of mortality in the 10-14 age group was the highest. These figures necessarily speak about

remarkable achievement in controlling child mortality in the country. Unfortunately, however, the mortality situation as revealed by the estimates of the age-specific death rates given in the table for the decade 1961-71, is rather gloomy. The death rates for the 5-9 and the 10-14 age groups during the decade 1961-71 show worsening trend (a reversal in the trend of declining mortality noticed in the previous decade). As is evident from the age-specific death rates for the decade 1961-71, excepting the 0-4 age group where the figures had recorded a decline both in case of males and females, the death rates for the 5-9 and the 10-14 age groups had increased and the percentage of increase in the death rates for the 10-14 age group was the highest.

Table 3.20: Childhood mortality by age and sex, 1941-51 to 1961-71

Decade	Age-group	Male	Female	Percentage decline	
				Male	Female
1941-1951	0-4	78.29	83.71		
	5-9	15.53	17.61		
	10-14	12.04	11.04		
1951-1961	0-4	54.90	54.68	29.9	34.7
	5-9	6.30	7.76	59.4	55.9
	10-14	3.61	3.97	70.01	64.0
1961-1971	0-4	44.69	45.85	18.6	16.1
	5-9	7.14	10.44	(—) 13.3	(—) 34.3
	10-14	5.18	5.76	(—) 43.5	(—) 45.1

Source: U.P. Sinha, "Health Programmes and Childhood Mortality", in K. Srinivasan, P.C. Saxena and Tara Kanitkar, (eds), *Demographic and Socio-Economic Aspects of the Child in India*, Bombay, Himalaya Publishing House, 1979. p. 297.

Sex-wise analysis of age-specific death rates (Table 3.20) shows that except for the 10-14 age group in 1941-51 and the 0-4 age group in 1951-61, the mortality among female children was higher than that of male children in all the three decades. Also, the pace of decline in the level of mortality of female children was lower than the rate of decline in the level of mortality of male children, during the decades 1941-51, 1951-61 and 1961-71.

The review of the mortality situation, based on the sex-wise crude death rates, expectation of life at birth and infant and child mortality, clearly reveals that the level of mortality among Indian females has always been higher than that of males. Also, the rate of reduction in mortality in the case of females has been slow as compared with the same for males. The higher mortality rates for females in India may be attributed to the inferior status they are accorded as 'second class citizens'²¹. The social set-up is largely responsible for discrimination between the two sexes. It is almost universally the case that whereas a male child is ardently desired, the birth of a female child is unwelcome and she generally receives less attention than would be given to a son²². Social factors are unfavourable to females and start operating from birth. In a demographic survey conducted in Varanasi, it was found that a male child, on an average, was breast-fed for a longer period than a female child²³. Also, in a health survey conducted in some rural areas of Maharashtra, it was observed that sick female children were given traditional treatment or did not receive any treatment, while free treatment from qualified doctors was sought for sick male children²⁴. Even today, due to malnutrition and excessive child-bearing, Indian women are exposed to more health hazards. Maternal mortality rates in rural India are also found to be high²⁵. The self-sacrificing nature of Indian women and poverty cause malnutrition and predisposition to disease. It is generally observed that in families, females take their meals only after the males have finished and eat whatever is left. Also, the low status of women is an important factor contributing to the higher mortality among females.

Causes of death in infants and children (1-5 years)

The importance of examination of infant and child mortality statistics by causes of death is well recognized, as it provides clues for taking preventive and control measures. Table 3.21 gives ten major causes of death among infants and children aged 1 to 5 years, identified by the Registrar General of India in the report of the *Survey on Infant and Child Mortality, 1979*. It may be seen from the statistics presented in the table that the highest toll of life among infants is taken by tetanus. Diseases due to poor environmental conditions — like gastroenteritis, diarrhoea, dysentery and poliomyelitis — are also major causes of death. It is now well known that the causes of infant mortality are related to immunity, health and nutritional status of pregnant women, the process of child birth and the care that the new-born infant receives immediately after birth.

Among children aged 1 to 5 years, typhoid is found to be the major cause of mortality. Deaths due to pneumonia, dysentery, jaundice, and diarrhoea are also alarmingly frequent (Table 3.21).

Table 3.21: Ten major causes of death in infants and children (1-5 years)

<i>Infants</i>		<i>Children (1 - 5 years)</i>	
Diseases	% of deaths	Diseases	% of deaths
1. Tetanus	15.2	1. Typhoid	11.0
2. Prematurity	7.9	2. Pneumonia	8.4
3. Pneumonia	6.8	3. Dysentery	7.0
4. Dysentery	6.1	4. Jaundice	6.2
5. Influenza	4.9	5. Diarrhoea	5.8
6. Malaria and other fevers	4.7	6. Malaria and other fevers	5.3
7. Typhoid	3.8	7. Influenza	5.2
8. Other respira- tory diseases	2.6	8. Other respira- tory diseases	2.3
9. Diarrhoea	1.6	9. Gastroenteritis	1.7
10. Gastroenteritis	1.3	10. Tetanus	1.4

Source: Registrar General of India, *Survey on Infant and Child Mortality, 1979: A Preliminary Report*, Ministry of Home Affairs, Government of India, New Delhi.

A number of these diseases are preventable and can be checked if effective general and specific measures against them are taken. Today, the control of respiratory infections mainly depends on vaccination. Of late, the most outstanding success has been achieved in controlling small pox in the country. It may, however, be noted that vaccination programmes can be effective only if a sufficiently high proportion of the susceptible population is immunized; and even then the effort may not always be adequate. For example, BCG vaccination without adequate treatment facilities is unlikely to lead to any effective control of tuberculosis. Besides, many respiratory diseases are aggravated by malnutrition; and unless this condition is corrected, the effective control of diseases cannot be expected. Poor housing and over-crowding, as a result of which infected and susceptible individuals are brought into close contact, are other major factors which hamper efforts at controlling diseases. Also,

a majority of gastrointestinal infections can be controlled only by making safe drinking-water available and ensuring satisfactory sanitation. However, for poliomyelitis these measures would not be enough. The Vaccination would also be necessary²⁶. Also, the vaccine used in immunization programmes, must be kept under refrigeration right from its manufacturing plant to the delivery point, maintaining the *cold chain* so that its potency is not lost.

Health programmes

The Integrated Child Development Scheme (ICDS) of the Government of India, offers a package of services and nutritional supplements for children under six and for pregnant and nursing mothers. These services include health check-ups, immunization, health education, referred services and informal education. All these services are in addition to the current Maternal and Child Health (MCH) programmes under implementation in the country²⁷. In all these programmes, great stress has been laid on immunizing the population. However, immunization programmes alone will not bring down the level of mortality unless there is a simultaneous improvement in sanitation, supply of safe drinking water, nutrition, personal hygiene, education, housing and services for the early diagnosis and prompt treatment of diseases.

Migration

Migration is regarded as the third component of population change after fertility and mortality. Hence, like the latter two, it also becomes an important variable for the study of population dynamics of a given area.

Every member of a population resides at some particular location. A change in the location of residence is termed *spatial mobility*. This mobility can take place in the following three ways:

- (i) When the change of residence is across national boundaries, this is termed *international migration*.
- (ii) When the change of residence is from one community to another, while remaining within the country, this is called *internal migration*
- (iii) When the change of residence is within the same community, this is termed *local movement*.

Since local movement does not affect the size and composition of the population of the community, the study of migration is mainly concerned with international and internal migration.

Meaning and definition of a migrant and some important terms associated with migration

'Who is a migrant?' While answering this question one has to consider several issues. The first one is the choice of migration-defining boundaries. In most cases, choice is limited, since one has to follow the legal boundaries. The choice of boundaries for defining internal migration must usually be between three: (i) provincial or state boundaries; (ii) district boundaries; and (iii) the boundaries of the civil division, such as city, town, village, etc.

If internal migration is defined as that taking place across state boundaries only, many movements within the state will not be considered to be migration and hence the estimates of migration will err on the low side. On the other hand, if migration is defined on the basis of boundaries of each city or town or village, will it give the correct estimate of migration? Should a person who goes temporarily to hill-resort during the summer months be considered a migrant? Is a student who goes away for studies and stays in a hostel, a migrant? In fact, a condition usually taken into consideration while defining migration is the intention of the person to settle permanently (or semi-permanently) at the new destination. From this point of view the person going to a hill-resort is not a migrant but the student is defined as a migrant since he does not know as to when he will return, or even whether he will return at all.

Thus, a migrant is a person who has changed his residence from one geographically well-defined area to another area with the intention of permanently or semi-permanently settling at the new place. The place which the migrant leaves is called the *place of origin* and, for that place, the person is an *out-migrant*. The place where the migrant arrives is known as the *place of destination* and, for that place, the person is called an *in-migrant*. Thus, the same person is an out-migrant for the place of origin and an in-migrant for the place of destination. When the migration takes place across international boundaries, the terms used are *emigration* and *immigration*. For a given geographical area, where the in-and out-migrations take place continuously, the net change in the population over a period of time is the net balance of in-and out-migrations. Thus, the population of that particular area grows. For example, the net in-migration in selected pockets of the country over a fairly long period of time, has led to a much faster growth of population in those areas.

The analysis of migration is usually carried out by breaking up the total time period into a series of intervals and assembling data separately for each interval. Intervals of ten years have generally been used in migration analysis.

The quantum of migrants who depart from a particular area of origin and arrive at a specific area of destination during a specified time interval is known as the *migration stream*. For example, people moving from Kerala to Maharashtra in a decade form such a migration stream.

Sources of data for migration analysis

Like births and deaths, it is equally important to record all permanent or semi-permanent changes in residence made by the people of any given geographical area. This can be achieved by maintaining 'population registers' and updating them regularly. Unfortunately, however, very few countries in the world have succeeded in maintaining population registers. In the absence of these registers, the estimates of in-and out-migration can be arrived at by including appropriate questions in a population census or in a sample survey. In India, information on migration is obtained by asking a question on place of birth in the population census. A person is considered as a migrant if his place of birth is different from the place where he has been enumerated. This provides information on *life time migration* of the people, since once a person has shifted from his place of birth, he becomes a migrant and remains so for his life time. Indirect techniques have been developed to obtain estimates of the size and age-pattern of migrants into specified territories between two successive censuses. These estimates are called *inter-censal estimates* of migration.

The estimate of migration during the two successive censuses or between, or in other specified time-periods, can also be obtained from the additional information on 'duration of residence at the place of enumeration' available for the first time in the 1961 census and in the two subsequent censuses.

In the 1971 census of India, an additional question on 'place of last residence' was also asked. This was an improvement over the question on 'place of birth' as far as the estimation of migration flows was concerned, since a person who returns to his birth place after living a number of years at another place will be counted as non-migrant in the latter case but in the former case, he will be counted as a migrant. In the 1981 population census, one more question on 'reasons for migration' had been included.

If migration flows are considered at the state level, people from a particular state who move out and go to other states, are added up according to the place of birth. The sum total of persons born in state 'A' and counted in states B,C,D,... will give the number of life time out-migrants from state 'A'. Similarly, the sum total of persons born in states B,C,D,... and counted in state 'A' gives the number of in-migrants for

state 'A'. The difference between these two figures provides the estimate of net-migration into state 'A'. If the difference between in-migrants and out-migrants is positive, the state has gained in population by migration, but if the difference is negative, the state has lost its population through the process of migration.

The volume of migration in any country or state can also be determined between any two points of time if the information on births and deaths between them are available. For example, if P_0 and P_1 represent the total population at the beginning and at the end of the interval, and if B and D represent the total births and deaths, respectively, then net-migration, M can be estimated from the population:

$$M = (P_1 - P_0) - (B - D)$$

Migration rates

Like birth and death rates, the net-migration rate (m) during a specified time interval can be defined as:

$$m = M/P * 100$$

where, M = the number of net migrants, and P = the average population of the area during the time interval.

Similarly, in-and out-migration rates can be defined as:

$$\begin{aligned} \text{In-migration rate} &= I/P * 1000 \\ \text{Out-migration rate} &= O/P * 1000 \\ \text{Gross-migration rate} &= [(I+O)/P] * 1000 \end{aligned}$$

where, I = In-migration during the specified time interval, and O = out-migration during the specified time interval.

Like sex-age specific death rates, migration rates specific to certain characteristics of the population can be computed if the relevant data to determine the number of migrants possessing specific characteristics are available. Thus:

$$m_i = M_i/P_i * 100$$

Where = the rate of migration for population of a specified geographical area characterized by trait i (e.g. sex, age, marital status, etc.); M_i = number of migrants characterized by the same trait i ; and P_i = total population of the area possessing the same trait i .

When data on population movements are not available from population registers, nor are they available from a population census, demographers use indirect methods of measuring the quantum of net migration. These methods either use the

information on the size of population at two points of time and on births and deaths during the interval (by building the 'population equation' as indicated earlier) or use the sex-age distribution of the population at two successive censuses and the sex-age specific survival rates. However, these methods are beyond the scope of this chapter and, hence, have not been discussed here.

Migration trends in India

The volume of internal migration in India is still not large. A study of internal migration indicates the existence of four types of migration streams. These are (i) rural to rural, (ii) rural to urban, (iii) urban to urban, and (iv) urban to rural. Table 3.22 gives the pattern of distribution of migrants by sex in these four types of streams for 1961, 1971, and 1981.

Table 3.22: Percent distribution of internal migrants by sex-India, 1961, 1971 and 1981

Migration stream	1961			1971			1981		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
R to R	73.7	56.7	81.3	70.3	53.5	77.8	65.2	45.4	73.4
R to U	14.6	25.7	9.7	15.5	26.0	10.5	16.6	27.7	12.0
U to U	8.1	13.0	5.8	8.9	14.0	6.7	12.1	19.1	9.1
U to R	3.6	4.6	3.2	5.5	6.5	5.0	6.1	7.6	5.5
Total	100	100	100	100	100	100	100	100	100
Migrants									
In million	134.4	41.4	93.0	156.6	48.3	108.2	201.3	99.2	142.4

Source: Registrar General of India

In India, the major migratory movements are rural to rural, particularly among females. However, compared to 1961, the volume of migrants of this stream had

slightly lessened by 1971 and recorded a further decrease in 1981. From the table it may also be seen that the number of female migrants is more than twice the number of males. This is basically accounted for by migration after marriage because of the system of village exogamy. It has also been observed that migration is largely of younger persons in the age group 15 to 35. Among males, the major migration flows are for seeking employment. The metropolitan cities like Bombay, Calcutta, Delhi and Madras, having great job potential, have attracted large influxes of migrants from both rural and urban areas of all the parts of the country.

The extent and pattern of migration flows are determined mainly by three key variables, namely, employment, income and rapid population growth. People move out from areas where employment opportunities are scarce, where income is low and where the population pressure is high due to greater natural increase (births over deaths). On the contrary, people are attracted to areas of new industrial development and regions of higher per-capita income. In India, some of the reasons for low migratory flows of people from one region to another are: the continuous dependence of most of the people on agriculture; the caste system and strongly-knit communities; the diversity of languages and culture; the lack of education; and the low level of industrialization.

The migration process has a significant effect on both the communities of origin and the communities of destination. Demographically, migration affects the sex-age composition of the population of the areas from which people come and the areas in which they finally settle. It brings social and economic change. In most nations there are areas of high and low fertility and also areas of expanding opportunities for employment and of stationary or declining economic opportunities. A shift of population from areas of high birth rate to those of low birth rate, from areas of declining economic opportunities to areas with expanding opportunities, acts as a device for maintaining demographic, social and economic balance among communities.

POPULATION ESTIMATES AND PROJECTIONS

History of Population Projection

The estimation of population for future dates has been possible only since the development of national censuses. As detailed information about population growth was not available in the early stages, population projections were mainly based on the assumption of a uniform rate of growth. Since the estimates became more numerous, the limitation of the assumption of the uniform rate of growth was

recognized. This led to the development of more complicated mathematical functions for population projection.

P.F. Verhulst was the first to suggest that population growth could be described more rationally through a curve of a type which he called the *logistic curve*. It possessed the characteristics of proceeding from a determinate lower limit to a determinate upper limit. Verhulst fitted the curve to the population counts for France, Belgium, Russia and the county of Essex in England. He, however, abandoned the idea of developing a law of population, as the available census counts were not sufficient for this purpose.

The *logistic curve* was forgotten for a long time till it was rediscovered as the 'Expression of the Law of Population Growth' by Raymond Pearl and Lowell J. Reed. They fitted the logistic curve to the population of a large number of countries. For a number of years the logistic curve occupied a central place in population estimation and projection. But as years passed, with the development of better methods, it lost much of its importance. It is no longer considered a law of population growth.

When vital statistics became increasingly available, the possibility of improving population estimates by making projections for the separate components of the population was recognized. The need for detailed information about the characteristics of a future population accelerated the development of methods which were better than the mathematical methods.

The component method of population projection consists of projecting separately the population in different age-sex groups on certain assumptions of the future course of fertility, mortality and migration. It came into use towards the end of the first quarter of this century. Today, this is widely accepted method for population projection.

Uses of Population Estimates

All development plans, either economic or social, require in advance the knowledge about future population, its size and characteristics. In fact, these are the basic data for estimating the future requirements of food, clothing, shelter, etc., and are essential for both short-and long-term planning. It is difficult, for example, to estimate food requirements of a country in future without knowing what the population size would be. Further, since the food requirements of infants, adults, and the aged differ, the probable size of the population in each of these categories during coming years should be known beforehand. Similar information is required to assess the needs in regard to shelter, clothing, education, health, etc.

Planning also requires assessing future potentialities. Thus, projection is indispensable for estimating future human resources, persons who can contribute to the economic activity, reproduction of population, etc. Estimates of future population are also required for the proper preservation of national resources.

At the local level, population projections are needed for assessing the future requirements for water, transportation and roads, schools, hospitals, etc. This requires long term forecasts.

Since the population census is conducted only at fixed intervals, usually every ten years, it is necessary to compute certain demographic indices based on population figures not only annually but often even monthly. The vital events like births and deaths are tabulated by calendar year. Therefore, population figures are also needed for periods other than those covered by a census.

Various Terms Used for Population Projections

For referring to future population, the terms generally used are *estimates*, *projection*, *prediction* and *forecast*. However, all these terms do not mean the same thing. The term *estimate* is used to refer to both past and future populations and estimates of the future population are referred to as *forecasts*, or *predictions*, or *projections*. The distinction between a *forecast* and a *prediction* is not very clear and these can be taken to mean the same thing. But the distinction between a *prediction* and a *forecast* on the one side, and a *projection* on the other may be clearly spelt out. Estimates of future population obtained on the basis of a base population and a certain assumed future growth rate, is called a *population projection*. But this need not be a *prediction* or *forecast* of the future population. *Projection* is not always done with the object of forecasting. It is of interest to know, especially for analytical purposes, what the future population will be, though the conditions, under which it is known, may not be realistic at all. For example, in order to formulate a country's population policy it is imperative to know the future size of the population under various assumptions of fertility decline. This is what is called a *projection*. This *projection* may be regarded as a *forecast* only when it is asserted that the assumed course of fertility, mortality and migration change will in fact take place. Therefore, the same population figure can be regarded a *forecast* or a *projection* according to the claim put forth by the estimator.

It is advisable to avoid the use of the term *forecast* or *prediction* with reference to population estimates. A certain amount of uncertainty is unavoidable in any estimation of future trends of fertility, mortality and migration. Even if our understanding of the past is more complete, the future is inevitably uncertain.

Therefore, it is desirable not to claim any certainty as far as future demographic trends are concerned. *Projection* is a term intended to imply no more than an illustrative computation based on a set of given assumptions regarding the future course of fertility, mortality and migration.

Types of Population Estimates

The term population projection is generally used in a broad sense and it does not concern itself with projection alone. The following three types of population estimates are usually obtained:

- (i) Inter-censal estimates;
- (ii) Post-censal estimates; and
- (iii) Future estimates.

These estimates differ from one another only in respect of their reference to the period in question. Population figures, estimated for a data falling anywhere between two dates for which the actual census returns are available, are termed as *inter-censal estimates*. *Post-censal estimates* are those made for any period of time following a census upto the present moment of time. *Future estimates* are those made for any period of time after the present moment.

Methods of Population Estimation

Population estimates (inter-censal, post-censal, and future) can be obtained by a variety of methods. The most important among the widely used methods are:

- (i) Mathematical methods;
- (ii) Component method; and
- (iii) Economic method.

Mathematical methods are simple and mechanical and are generally used to obtain inter-censal and post-censal estimates of population. The methods consist of expressing the population of a region as a function of time, the parameters involved in the function being expressed in terms of the population count at two or more census dates. The formula is generally applied to total population, though it is possible to apply it to the various age, sex groups also. The use of these methods, however, presupposes that the trend of total population growth is fairly regular and that the future will be an orderly extension of the past. Mathematical methods are particularly inappropriate for long-term population projections, particularly for areas where rapid economic and social changes are expected.

The component method of population projection is used to project various components of population growth separately. This is more logical because it is easier to make plausible assumptions about the future course of some components than of the others.

The economic method is based on the principle that the population growth of a region country can seldom be expected to be independent of changing economic conditions. It is now well-recognized that economic factors influence fertility, mortality and migration. Therefore, it may be more appropriate to take some suitable economic factors as independent variables and population projection or rate of population growth as the dependent variable. The latter is regressed with the former variables and the function is used to obtain population estimates.

Population Projection for India

Population projections for India have been made since the beginning of the 1950s. In fact, after independence in 1947, the need for both short-term and long-term population projection was felt in the context of development planning. In response to that need, the literature on projections has grown enormously over the years since then. Some of the important projections include those by Frejka (1973) the International Bank for Reconstruction and Development (IBRD 1973), Ambannavar (1975), United Nations (1977), Cassen (1978), the Expert Committee on Population Projections, Census of India, 1971 (1979) and Census of India 1981 (1984). The high projection (Projection III) of the Expert Committee was the officially accepted projection for India and was used for planning purposes.

It is interesting to note that the projections made by different agencies and authors differ not only in their assumptions about the future course of fertility and mortality but also in their base line population figures. For example, Frejka started his projections with a base population of 534.3 million for 1970; the IBRD used a base figure of 537 million for 1970, which was taken from the U.N. Demographic Year Book 1970; and Cassen felt it necessary to adjust India's 1971 enumerated population of 547.9 million upward to 557.3 million in order to compensate for under-enumeration of 1.7 per cent (as revealed in the post-enumeration check) and also to adjust for differentials in the under-count in different age groups. The projections of the Expert Committee started with a base population of 547.1 million as on 1 March 1971 (the census count was as on 1 April 1971). Although the fertility and mortality assumptions of the projections varied greatly, some of the projections are likely to come out to be quite close to each other at the end of the present century.

Projection III of the Expert Committee on Population Projection, which was recommended for official use, estimated the population of the country as 672 million for 1981, which fell short of the actual count by about 13 million. Also, the projections were made upto the year 1991.

In the wake of the availability of the primary data from the 1981 census, a fresh exercise of making population projections for the country was carried out by the Registrar General & Census Commissioner of India (1984). The base levels of fertility and mortality as well as the population projections were worked out on the basis of 5 per cent sample data of the 1981 census. Three courses of fertility decline and one course of mortality decline have been assumed to yield three sets of population projections, namely, 'High', 'Medium' and 'Low'. In all the three sets, net-migration has been assumed to be negligible. The three sets of population estimates obtained for 1986, 1991, 1996 and 2001 are summarized in Table 3.23. The age-sex distributions of the projected population obtained under three variants, are, however, given for the year 2001 (Table 3.24). The set of the medium projection has been recommended for official use.

Table 3.23: Projected population of India, 1981-2001 (in million)

Year	Projections		
	High fertility	Medium fertility	Low fertility
1981	685.2	685.2	685.2
1986	758.2	758.2	758.2
1991	843.5	836.5	832.5
1996	942.0	915.5	901.0
2001	1052.0	991.5	959.2

Source: Registrar General and Census Commissioner of India (1984), Paper I, *Population Projections for India 1981-2001*, p. 7.

Sex and age composition of the projected population

A by-product of the component method of population projection is the sex and age distribution of the projected population shown for the three alternative projections of the Registrar General and Census Commissioner of India (1984) in Table 3.24. A comparison of the population pyramids for 1981 and 2001 would reveal that their shape begins to change substantially by 2001 under all three assumptions. Although

Table 3.24: Percentage distribution of the Indian population by age and sex in 1981 and 2001 under alternative assumptions of population growth

<i>Age group</i>	<i>1981</i>		<i>2001 Alternative Projections</i>			
				<i>High fertility</i>		
	<i>Male</i>	<i>Female</i>	<i>Total</i>	<i>Male</i>	<i>Female</i>	<i>Total</i>
0-4	13.99	14.36	14.17	13.45	13.48	13.47
5-9	13.38	13.52	13.45	11.88	11.88	11.88
10-14	12.22	11.93	12.08	10.48	10.47	10.47
15-19	10.24	10.03	10.14	9.22	9.20	9.21
20-24	8.49	8.61	8.55	8.54	8.58	8.56
25-29	7.31	7.58	7.44	8.50	8.44	8.47
30-34	6.38	6.57	6.47	7.75	7.42	7.59
35-39	5.69	5.73	5.71	6.45	6.18	6.32
40-44	5.10	4.97	5.04	5.29	5.27	5.28
45-49	4.47	4.22	4.35	4.46	4.59	4.52
50-54	3.67	3.42	3.55	3.75	3.90	3.83
55-59	2.91	2.78	2.85	3.16	3.27	3.21
60-64	2.26	2.26	2.26	2.59	2.65	2.62
65-69	1.66	1.70	1.68	1.98	2.00	1.99
70+	2.23	2.32	2.26	2.50	2.67	2.58
All ages	100.00	100.00	100.00	100.00	100.00	100.00

Contd. Table 3.24

Age group	2001 (Alternative Projections)					
	Medium fertility			Low fertility		
	Male	Female	Total	Male	Female	Total
0-4	10.73	10.76	10.74*	9.21	9.23	9.22
5-9	10.69	10.68	10.69	9.96	9.96	9.96
10-14	10.44	10.43	10.44	10.40	10.40	10.40
15-19	9.79	9.77	9.78	10.12	10.10	10.11
20-24	9.07	9.11	9.09	9.37	9.42	9.39
25-29	9.02	8.96	8.99	9.32	9.26	9.29
30-34	8.23	7.88	8.06	8.50	8.14	8.33
35-39	6.85	6.56	6.71	7.08	6.78	6.94
40-44	5.61	5.59	5.60	5.80	5.78	5.79
45-49	4.73	4.87	4.80	4.89	5.03	4.96
50-54	3.98	4.14	4.06	4.12	4.28	4.20
55-59	3.36	3.47	3.41	3.47	3.58	3.53
60-64	2.75	2.81	2.78	2.85	2.91	2.87
65-69	2.10	2.13	2.11	2.17	2.20	2.18
70+	2.65	2.84	2.74	2.74	2.93	2.83
All ages	100.00	100.00	100.00	100.00	100.00	100.00

Source: Derived from Registrar General and Census Commissioner of India (1984), paper I, Population Projections for India, 1981 — 2001, pp. 10-15.

the shape would remain pyramidal under all the three projections, it would resemble to an inverted top more closely in case of the low fertility projection. This change in the shape of the population pyramid implies a much higher proportion of women in the child-bearing ages in the year 2001 than in 1981 and hence, the contribution of a large number of births even after a sharp decline in fertility has occurred.

EVOLUTION OF NATIONAL POPULATION POLICY AND FAMILY PLANNING PROGRAMME STRATEGIES

A 'population policy' consists of both the formulation of and articulation by the government of some population objectives or a set of objectives that maximize the public welfare and levels of living. It involves the commitment and manipulation of resources in pursuit of these population objectives. One may also say that population policies are 'measures and programmes designed to contribute to the achievement of economic, social, demographic, political and other collective goals through affecting critical demographic variables, namely, the size and growth of population, its geographic distribution (national or international), and its demographic characteristics' (UNESCO).

Thus, a population policy is not purely an instrument of fertility regulation, but it also implies affecting population size by net migration, or by changing certain demographic characteristics such as marital status, educational attainment, work participation, etc.

It is clear that a population policy is not always an anti-natalist policy; it can be pro-natalist as well, if encouraging fertility leads to greater public welfare and to raising the levels of living.

Population policy is not a new concept. Population policies have been enunciated from time immemorial in one form or another. For example, Plato, the great Greek philosopher, said that an 'ideal state' should be closely restricted to not more than 5040 citizens (that is, adult males who are not slaves; it also implied a population of roughly 50,000 for a city state). Marriage ties should be ordained by rulers, not by the individuals concerned, and men should only have children between the ages of 30 and 55.

Aristotle made stronger statements to prevent any excessive increase of population and suggested (i) exposure of the new born; and (ii) coercive emigration.

There have been periods in history when the governments encouraged population growth through early marriages, and by encouraging most women to marry on

reaching the age of puberty. In modern times, the Soviet Union has been following a pro-natalist population policy since the Second World War. A few years ago, the Malaysian Government announced a pro-natalist policy for the Malay people.

In India, right from the beginning of this century, several intellectuals have expressed their concern about the country's excessive population, both from the viewpoint of the health of mothers and children, as well as of the socio-economic effects of rapid population growth. The first well-known public advocacy of limiting family size in India was made by P.K. Wattal in 1916 in his book *The Population Problem in India*. He put his argument in both health and socio-economic terms. A 'Birth Control League' was started in Bombay in 1923 and another in Pune. The All India Women's Conference passed a resolution in 1932 at Lucknow recommending that 'men and women should be instructed in methods of birth control in recognised clinics'. The National Planning Committee set up by the Indian National Congress in 1935 under the chairmanship of Jawaharlal Nehru strongly supported propagation of the knowledge and practice of family planning.

Soon after independence, the Government of India appointed the Planning Commission to formulate a plan for the most effective and balanced utilization of natural resources for economic development. The Planning Commission, in formulating the First Five Year Plan (1951-56), recognized that a population policy oriented towards restraining the rate of population increase in relation to economic development and raising the level of living of the people is essential to planning and that family planning is a step toward improving health, particularly that of mothers and children. In this plan, a provision of Rs. 65 million was made for the family planning programme which was designed to discover effective techniques of family limitation and to suggest methods by which knowledge of the techniques could be widely disseminated. Thus, India became the first country in the world to have a state-sponsored population control programme. During this plan, a Population Policy Committee was set up in April 1952 and, subsequently, a Family Planning Cell was created in the Directorate General of Health Services. Moreover, 21 rural and 126 urban family planning clinics were established in different parts of the country.

The family planning programme activities were expanded and intensified in each successive five year plan, raising the expenditure from Rs. 50 million in the Second Five Year Plan (1956-61) to Rs. 14,292 million in the Sixth Five Year Plan (1980-85), as shown in Table 3.25. An outlay of Rs. 32,560 million was made for the Seventh Five year Plan (1985-90).

Table 3.25: Budget outlay and actual expenditure on family planning in India, 1951-56 to 1985-90
(Outlay and expenditure in million rupees)

<i>Five year plan and period</i>	<i>Budget outlay in public Sector</i>			<i>Actual expenditure on family planning</i>
	<i>All developmental activities</i>	<i>Family planning</i>	<i>Col. (3) as per cent of Col. (2)</i>	
<i>(1)</i>	<i>(2)</i>	<i>(3)</i>	<i>(4)</i>	<i>(5)</i>
First 1951 - 56	23,560	6.50	0.03	1.45
Second 1956 - 61	48,000	49.70	0.10	21.56
Third 1961 - 66	75,000	269.76	0.36	248.60
Annual 1966 - 69	67,565	829.30	1.23	704.64
Fourth 1969 - 74	159,020	3,150.00	1.98	2,800.40
Fifth 1974 - 79	393,220	4,970.00	1.26	4,090.00
Sixth 1978 - 83	710,000	7,650.00	1.08	NA
Sixth * 1980 - 83	975,000	10,000.00	1.04	NA
Seventh ** 1985 - 90	1,800,000	33,928.90	1.88	NA

Note: * Figures are based on Draft Five Year Plan prepared before the parliamentary elections held in January, 1980.

** Figures based on the Draft Sixth Five-year Plan, 1980-5 prepared by the reconstituted Planning Commission in January 1981. During 1978-80, the total expenditure on family planning is estimated to have been Rs. 2,261 million against an allocation of Rs. 2,280 million.

In the Third Five Year Plan (1961-66), the strategy of the family planning programme was changed from a 'clinical' to a 'community extension' approach. This aimed at : (i) embedding the concept of birth control in family planning and health services near home through an extension network of primary health centres (PHCs) and sub-centres in the rural areas; and (ii) conducting an intense educational, motivational and communication campaign which had the effect of lifting the taboo on free and open discussion on different aspects of family limitation.

From the Fourth Five-Year Plan onwards, family planning services were integrated with maternal and child health (MCH) services, and the medical and para-medical staff at the rural PHCs and urban welfare centres were completely involved in the programme. Incentives were built into the programme for : (i) persons coming forward for vasectomy; tubectomy operations; (ii) motivators; and (iii) doctors. Camps were held from time to time at various places for sterilizations. Consequently, the achievement of the family planning programme, particularly in terms of the number of sterilizations, improved very substantially over time.

The 'cafeteria approach', in which various alternative means of family limitation (both terminal and spacing) were propagated from the middle of 1960s, did not make much headway as the official emphasis remained on terminal methods alone.

In 1971, Parliament legislated the Medical Termination of Pregnancies (MTP) Act, which permitted legal termination of a pregnancy within the first trimester on grounds of : (i) poor physical or mental health of the mother; and (ii) pregnancy arising out of contraceptive failure, or due to rape, etc. This Act became operative from April 1972.

In 1975-76, the central government recognized that to promote family planning at a faster pace, it was necessary to involve other development agencies of the central and state governments, and also all organisations which have influence with the people and which were aimed at public welfare. A comprehensive 'National Population Policy' was therefore evolved and was presented to the Parliament by the then Health Minister on 16 April 1976. Besides emphasizing that population control played a crucial role in the movement towards economic independence and social transformation, especially in the light of the 20 point programme, the statement said that 'the government have decided on a series of fundamental measures, which, it is hoped, will enable us to achieve the planned target of reducing the birth rate from an estimated 35 per thousand in the beginning of the Fifth Plan to 25 per thousand at the end of the Sixth'. These measures included setting aside 8 per cent of central assistance to state plans specifically against performance in family planning, freezing of the representation in the central and state legislatures on the

basis of the 1971 census population for the next 25 years, raising the age at marriage to 18 years for girls and 21 years for boys, higher graded monetary compensation, higher priority for girls' education up to the middle level, and higher priority to child nutrition.

Special measures were adopted by several states to make this programme a success. Incentives and disincentives were offered to encourage people, and at least the central and state government employees, to go in for sterilization.

There was, however, severe criticism of the compulsion used in the family planning programme during 1976. This programme went into disrepute, and its achievement fell very sharply during 1977 and 1978, after the fall of the Congress government in 1977. The number of sterilizations dropped from 8.3 million in 1976-77 to 0.95 million in 1977-78, and to 1.5 million in 1978-79. While the new government, in its population policy statement, stressed the importance of limiting population growth, it emphasized the voluntary nature of the family planning programme. Simultaneously, the name 'family planning' was replaced by 'family welfare'. Besides other items of the 1976 policy, this policy statement advocated a greater role for the MCH services, an expansion of the immunization programme, improvement of women's education and population education, and the involvement of voluntary, youth and women's organizations.

A Working Group on Population Policy was set up by the Planning Commission in 1979 to formulate long-term policy goals and programme targets for the family welfare programme. The Group recommended the adoption of a long-term demographic goal of reaching the net reproduction rate (NRR) of unity by the quinquennium 1996-2001 for the country as a whole. The report of the Working Group was accepted by the Congress government which returned to power in 1980 and this report became the basis for the family welfare programme in the Sixth Five Year Plan, 1980-85.

After experiencing an abrupt fall in the performance of the family planning programme, the government has taken several steps during the past ten years to revitalize it through various means strengthening and expanding services through massive country-wide campaigns of dissemination of information, motivation and education; improvement of services; large-scale involvement of other development departments and voluntary agencies; and, at the level of the family, through interpersonal communication.

To increase the awareness about India's population problem and the necessity of limiting its future growth, the Government of India decided in 1970 to introduce a 'population education' programme in school education through the regular social

science subjects. The National Council of Educational Research and Training (NCERT) was given the responsibility of propagating population education in schools. The NCERT has since developed various units on population education for students in different grades which have been included in school textbooks.

The number of acceptors of contraceptive methods offered by the family welfare programme has increased consistently over time, and the 'couple protection rate' has reached almost 40 per cent in 1987-88. The Seventh Five Year Plan has laid down a target of achieving an effective couple protection rate of 60 per cent by 2000 along with several other goals relating to birth rate, death rate, infant mortality rate, etc. However, if a big positive push is not given to the population control programme, it will not be feasible to achieve the set targets within the prescribed time period. According to the present indications, we may achieve the goal of NRR of unity only somewhere in the 2006 to 2011 instead of by 2001.

The population growth patterns and levels of birth and death rates in different states have important implications for future population policy and planning. These data indicate that special attention should be paid to the problems of individual states and to inter-state variations, to formulate a population policy that takes into account these variations and makes the all-India policy an integrated whole of appropriate state/union territory policies. States currently experiencing comparatively high death rates, particularly those lying in the Hindi-speaking belt, are likely to have faster reductions in mortality in the next two decades or so. As these are also the states with high birth rates, they are likely to experience even more rapid population growth in the near future unless they succeed in lowering their birth rate substantially. Any substantial reduction in the national birth rate would be possible only if there was a sharp decline in the birth rates in Uttar Pradesh, Bihar, Rajasthan, Madhya Pradesh, Haryana and Gujarat.

REFERENCES

1. *Population doubling time: A quick way to know approximately how long it will take a population to double in size is to divide 70 by the growth rate. Thus, a population that is growing at the rate of two per cent per year will double in 35 years (70 divided by 2=35)*
2. Dandekar, Kumudini, 'Why has the proportion of women in India's population been declining,' *Economic and Political Weekly*, Vol. 10 (42), October, 1975, pp. 16-83.
3. Davis, Kingsley, *The Population of India and Pakistan*, Princeton N.J., Princeton University Press, 1951, Chapter IV.
4. Ibid
5. Nath, Pran, *A Study in the Economic Conditions of Ancient India*, London, Royal Asiatic Society, 1929, Chapter V.
6. Moreland, W.H., *India at the Death of Akbar*, London, Macmillan, 1920, pp. 9-22.
7. Davis, Kingsley, *op. cit.*
8. Das Gupta, Ajit, 'Study of the historical demography in India', in D.V. Glass and Roger Revelle, eds., *Population and Social Change*, London, The Camelot Press Ltd., 1972, p. 425.
9. Datta, Jatindra Mohan, 'A re-examination of Moreland's estimate of the population of India at the death of Akbar', *Indian Population Bulletin*, Vol. 1, No. 1, Delhi, 1960.
10. Durand, John D., *World Population Estimates 1970-2000*, World Population Conference, Belgrade, New York, 1967.
11. Mahalanobis, P.C. and D. Bhattacharya, 'Growth of Population of India and Pakistan, 1801-1961', *Artha Vijnana*, March 1976.
12. Mitra, Ashok, *India's Population: Aspects of Quality and Control*, New Delhi, Abhinav Publications, 1978.
13. Davis, Kingsley, *op. cit.*
14. Two Union Territories, namely, Arunachal Pradesh and Goa, Daman and Diu got the status of statehood (Goa became a State, while Daman and Diu was given the status of a Union Territory) Thus now there are seven Union Territories.
15. An urban agglomeration is composed of a main city and a number of other cities, towns or other urban outgrowths (railway colony, university campus, etc.) in its close vicinity which form a continuous spread with the main city and whose day-to-day economy is closely linked with the maincity.
16. In the Indian census, urban areas are classified into the following six size - classes:

Size class	Population size
I	100,000 and above
II	50,000 to 99,999
III	20,000 to 49,999
IV	10,000 to 19,999
V	5,000 to 9,999
VI	Less than 5,000
17. Bhattacharjee, P.J. and G.N. Shastri, *Population in India*, New Delhi, Vikas Publishing House Pvt. Ltd., 1976, p. 14.
18. Kumarappa, J.M., 'The family and child welfare', *The Indian Journal of Social Work*, 1 March, 1941.

19. Jain, S.P., 'Levels and differentials of infant and child mortality : Determinants and demographic impact', in K. Srinivasan, P.C. Saxena and Tara Kanitkar (eds), *Demographic and Socio-Economic Aspects of the Child in India*, Bombay, Himalaya Publishing House, 1979, p. 97.
20. Sinha, U.P. 'Health programmes and childhood mortality', in K. Srinivasan, P.C. Saxena and Tara Kanitkar, *op. cit.*
21. Dandekar, Kumudini, *op. cit.*
22. Natarajan, D., *Census of India, Changes in the Sex Ratio*, Centenary Monograph No. 6, Office of the Registrar General, India, New Delhi, Government of India, 1972, p. 2.
23. Saxena P.C., 'Breast-Feeding : Its effects on postpartum amenorrhoea', *Social Biology*, Vol. 24 (1), Spring, 1977, p. 50.
24. Dandekar, Kumudini, *op. cit.*
25. Government of India, *Sex Composition in India*, SRS Analytical Series No. 4, Office of the Registrar General, India, Ministry of Home Affairs, New Delhi. 1972, p. 17.
26. Jha, Saroj, S. A. Mohamed and Gopa Kothari, 'Infant and Child Mortality in Bombay', in K. Srinivasan, P.C. Saxena and Tara Kanitkar, *op. cit.*
27. Sebastian, E.V., 'Maternal and child health programmes in India,' in K. Srinivasan , P.C. Saxena and Tara Kanitkar, *op. cit.*

SECTION - III
POPULATION AND DEVELOPMENT

Population and Development in Post-Independence India

L. RAMACHANDRAN

INTRODUCTION

Emerging from extensive studies on the fertility behaviour as well as contraceptive behaviour in many parts of the world, there are different schools of thought debating the relationship between population and development. One school of thought says that unless population growth is checked, the scope for advancement in any sphere of development will remain minimal. Another school of thought is that if available resources are properly channelized and utilized, the growth of population need not be a hindrance to development. It has also been enunciated that socio-economic development is a necessary precondition for the regulation of fertility behaviour. This view was very strongly advocated in the Bucharest Conference of 1974 to emphasize the immediate need for socio-economic development in the third world countries which have high rates of population growth.

With the above background, this chapter aims to discuss the demographic scene in India *vis-a-vis* the socio-economic development in the post-independence period (forty years of freedom).

The main focus of the discussion will be to address a few questions like

1. Whether the growth of the population has impeded development?
2. Whether the government policies and programmes for development have been relevant and adequately implemented?
3. Whether development has helped in fertility control?
4. What needs to be done for future well-being?

DEMOGRAPHIC SCENE

We may first consider briefly the demographic scene. In the pre-independence period the population was more or less stable with high mortality and fertility levels.

Subsequently the decline in mortality without any corresponding decline in fertility has resulted in accelerated population growth. The annual exponential growth rate of population was as high as 2.28 per cent for the decade 1971-81. Since independence there has been a near doubling of the country's population. At present the population is over 800 million. The rural population according to the 1981 census was 76.7 per cent and the urban population was 23.3 per cent.

Expectancy of life has been gradually improving from 32 years in 1951 to 58.6 years in 1987 but, in comparison to advanced countries, life expectancy in India is still quite low.

Though there is an appreciable decline in overall mortality, infant mortality continues to be quite high and this is attributed by experts to low socio-economic conditions, and inadequacy of health care facilities and their under utilization (129/1000 in 1970, 114/1000 in 1980, 97/1000 in 1985).

The age pyramid of India's population shows a broad base with the dependency ratio being as high as 85 in 1981. The dependency ratio is the number of persons in the age groups 0-14 and 60 + per 100 persons in the age group 15-59. The large number of persons in the young age group indicates the possibility of rapid population growth in future years, unless specific measures are taken to reduce fertility.

The accelerated growth of the population has been a matter of great concern for the government. A National Family Planning Programme was introduced in the First Five Year Plan with a modest investment for contraceptive services in hospitals and clinics. From the Third Five Year Plan onwards, the programme was strengthened with an extension education approach to improve the reach of the services in the community. It has been given a high priority among various programmes. The desire of the government was to bring down the birth rate to 25 per thousand at the end of the Fourth Five Year Plan. However, the acceptance of contraception has not been up to the desired level. The birth rate has been brought down to only 32.9 in 1985. The effective couple protection rate in 1986-87 was only 37.1 per cent. It has also been observed that the mean number of living children of sterilized cases was 3.5 (1985-86) and of IUD acceptors 2.3. It has been realized only that for a meaningful check of the population, contraception should be practised by much younger couples for the spacing of children.

DEVELOPMENT

The aim of human development is to improve the quality of life, primarily through the fulfilment of basic needs for survival and security. The developmental efforts

which government will have to pursue in the interests of society can be broadly conceptualized as follows:

<i>Economic Factors</i>	<i>Basic Human Needs</i>	<i>Socio-cultural Factors</i>
Agriculture	Food	Education
Industry	Water	Social welfare
Commerce	Shelter	Law
	Fuel	Electricity
		Transport
		Communication
		Environmental safety
		Health facilities

The main thrust in all the Five Year Plans was increasing agricultural production for achieving self-sufficiency in food. Next to agriculture, industry was given priority. It was only at the end of the Fifth Five Year Plan that agricultural production exceeded the target, with a surplus of food grains. The objectives in all the plans included increase in national income, expansion of employment opportunities, reduction in income inequalities and eradication of poverty. It was only from the Sixth Five Year Plan onwards that a significant reduction in the poverty ratio* was noticeable — from 48.3 per cent in 1973-78 to 37.4 per cent in 1983-84.

Let us review the situation to see to what extent the development programmes have helped the common man regarding fulfilment of the basic needs of food, shelter, water, fuel and education, which have generally been accepted as the basis for progress; and study this *vis-a-vis* population growth.

Food

The statistics available regarding the production of food grains claim that after the Fifth Five Year Plan, the country has become self-sufficient in food grains and that there has been so much surplus production that it was possible even to tide over the crisis of drought in some states in 1987. However, production is not a guarantee for

* Since food is considered as the most important necessity for survival, poverty in India has been measured on the basis of a per capita daily caloric intake of 2400 for rural and 2100 for urban areas.

the availability of food to the lowest economic segments of the population in the country. An analysis of the poverty profile in India and its projection for future years indicate that even by the year A.D. 2000, there will be a sizeable poverty-stricken population in the country with very limited purchasing power. The Public Food Distribution System and increased income generation for the alleviation of poverty are two important measures needing the greatest attention.

Mahatma Gandhi repeatedly stressed the need for self-sufficiency in the villages, not only for food but also for all consumer items required in daily life. During the British rule, Gandhiji was strongly preaching the 'Swadeshi Movement' and boycott of foreign goods. What he said in the context of foreign rule still holds good when we look at the present relationship between the cities and villages.

The production of all food items takes place in the rural areas. But while the rural folk have to work hard to produce the food commodities (including milk and animal products), they are not in a position to get enough for themselves. Moreover, their standard of life and the amenities they have are much below what the city dwellers get. Gandhiji wrote on 4 April, 1936 in the *Harijan* :

India is to be found not in its few cities but in its 7,00,000 villages. But we, town dwellers have believed that India is to be found in its towns and the villages were created to minister to our needs. We have hardly paused to enquire if those poor folk get sufficient to eat and clothe themselves with and whether they have a roof to shelter themselves from sun and rain.

There are many steps which the government could have taken from the time of independence which would have ensured enough to eat for every individual citizen.

In the first instance, land reforms are necessary to give opportunity and impetus to small landholders to grow on their own soil and to avoid paid or bonded labour, indebtedness, etc. Adequate irrigation is necessary to bring more and more land under cultivation. This is where the investments and efforts of the government have been neither enough nor appropriate. It is difficult to understand why large quantities of water should be allowed to go waste into the sea, and why, in spite of repeated floods every year, the government has not taken action to divert the water through a grid system of rivers, canals, drains, etc., which had been recommended by veteran engineers like Sir M. Visweswarayya and Dr. K.L. Rao. Such plans would have helped in increasing food production, improving communication and traffic, facilitated the prevention of floods and also avoided interstate disputes. Above all such scheme would have provided employment for many. The huge sums of money spent every year on flood control measures and flood relief, could very well have been diverted to promote schemes for the conservation of water.

At present agriculture in the country depends on the vagaries of nature, which are very difficult to predict. There are, therefore, fluctuations not only in food production but also in employment opportunities which have resulted in migration from villages to towns and cities as a continuing phenomenon.

There is no point in priding ourselves that India stands seventh among all nations in industry, when it has not been possible even to provide the basic needs of food and shelter to a sizeable proportion of the population. As Gandhi said :

The poor of the world cannot be helped by mass production but by production by the masses. The system of mass production, based on sophisticated, highly capital intensive, high energy depending and human labour-saving technology is not only irrelevant but also encourages the rich men to extract work from poor men and widens the imbalance of wealth, whereas the technology of production by the masses, making use of available knowledge and experience, is conducive to decentralisation, compatible with the laws of ecology, gentle in its use of scarce resources and designed to serve the human being instead of making him the servant of machines.

Alvin Toffler has clarified how, with rapid industrialization and automation, the natural resources which cannot be renewed are very fast being depleted, while there is always scope for living a modest and contented life by utilizing renewable resources which will be available for ever. In his books *Future Shock* and *The Third Wave*, he has warned the developing countries against lopsided development with concentration in cities and towns at the neglect of villages. Schumacher has also made a similar point in his book *Small is Beautiful*.

Shelter

Keeping in mind the recommended norms for space, light, ventilation, type of flooring, etc., academic surveys and also the census data have brought out that about 60 to 70 per cent of the people live in substandard houses, both in rural and urban areas. There is a glaring imbalance between the few rich and the vast number of poor. It is a matter for serious consideration whether the situation is to be attributed mainly to the rapid population growth or whether a better pace of development in regard to housing could have been achieved in spite of the growing population.

Housing, like any other necessity of life, is dependent on the earning capacity. But the next question to be asked is whether and how the government has approached this problem. Investments of the government on housing schemes have been mostly in the urban areas and no appropriate scheme has as yet been undertaken in the rural

areas. The cities and towns are expanding out of proportion whereas material for construction is scarcely available in the rural areas. There is often a mention of appropriate technology for construction in the rural areas but nothing has yet taken practical shape. In the village it is only a few with financial resources, who are able to live comfortably, whereas the large majority have to huddle in huts and semi-permanent structures.

While grandiose schemes for beautifying the cities with gigantic monumental structures, gardens, stadia, auditoria, etc., are continuously being undertaken, there has been no interest shown by the government to invest uniformly and consistently for improving living conditions in the villages. It is because of the poor sanitation and poor living conditions that some of the major communicable diseases persist and are difficult to tackle. Malaria and Filariasis could have been eradicated merely by proper drainage. In advanced countries in the West, diseases like poliomyelitis, diphtheria and tetanus were got rid of much before the discovery of vaccines, and that was possible mainly because of improved sanitation and education.

Water

In olden days when man evolved from the hunting and food gathering to the agrarian society, the tendency was to live near rivers and lakes. Later, digging of wells was resorted to when the settlement was away from rivers. Scarcity of water for drinking and washing used to be talked about a few decades ago only in desert regions and in places where subsoil water was very deep. But with the rapid migration that has been taking place from rural to urban areas, there is no city or town in India today which is not facing a shortage of water. Unfortunately, the situation is getting worse in the rural areas as well because of neglect of old systems which were to impound and store rain water.

In very recent years, some steps have been taken by the government to provide bore-wells in all villages under the 'Water Decade' scheme. Unless steps are taken to conserve water available from nature, and prevent its wasteful flow into the sea, it will be difficult to have a continuous source of water supply either from the surface or from below. It is the proper management of water that is required and it will be futile to say that the shortage of water is due to population growth.

Fuel

Traditionally the main source of fuel in the villages was from trees and bushes and from cattle dung. There was not much destruction of trees because only the dried leaves, twigs and branches which were discarded by the trees were collected and

used. Unfortunately, it is the lopsided urbanization and migration which are responsible for a fuel crisis that is now in evidence. Left to themselves villagers were not removing trees wholesale; they were only taking what the trees were shedding. But the demand from the cities and towns for timber for construction, for household and industrial fuel and for power generation, has motivated rich and greedy contractors to devastate trees and denude forests on an unprecedentedly large scale. This is being very much criticized by environmentalists, but not much has been done to restore the natural equilibrium in the ecology.

One of the teachings of the Buddha advocated the planting of trees; and in the days of Ashoka and other great rulers, tree plantation did take place. The whole area of India was covered with trees, was free of dust, with plenty of water, plenty of shade, plenty of food and materials. Our forefathers and seers realized that trees provided for almost all human needs. But trees have met the same fate today as the goose that laid the golden egg. We cannot with certainty say that the shortage of fuel is due to the population growth alone.

Education

Education has been well-recognized as a very important component of development. From the First Five Year Plan the intention of the government was to make education compulsory for every child and a system of free primary education has been in vogue. But in effect there has been no compulsion for education nor has the free education been appreciated and availed of adequately. The literacy rate over the four decades has shown very little improvement except in a few states in the country. (the literacy status was 16.7 per cent in 1951 and it rose to 36.2 per cent in 1981 - male 46.9 per cent and female 24.8 per cent).

One could straightway say that the infrastructure was not adequate and it could not cope with the growing population. However, the number of children who attend school has been so small that it cannot be argued that the infrastructure was not enough. Moreover, over the past four decades, we have witnessed the advance of huge number of private schools catering to the needs of those who could afford to pay. The governments have not taken enough specific steps to ensure that every child gets some education, formal or informal. The present system of school and college education has only resulted in large unemployment and frustration and has also made the situation worse by taking the youth away from their traditional trades and then leaving them in the lurch; thereby compelling them to leave the villages.

Influence of Development on Fertility Control

Two all-India surveys were conducted by the Operations Research Group, Baroda, regarding family planning practices in India in 1970 and 1980. According to the first survey there was a fairly high awareness in all the states about the terminal methods of contraception but very poor awareness about the temporary methods. However, the acceptance of contraception was only about 14 per cent (96 per cent of this was sterilization). The situation had only slightly improved in 1980. The awareness of all the methods had increased but was still very low in the rural areas. Regarding contraceptive practice, the percentage of users had gone up to 35 per cent in 1980 (out of that 63.5 per cent were acceptors of terminal methods, 12 per cent of condoms, only 4 per cent of IUD and the pill and 23 per cent of traditional methods).

The ORG report has brought out, in addition, the following points:

1. There was more acceptance of family planning in urban areas than in rural areas (51 per cent and 31 per cent).
2. There was more acceptance of family planning in higher castes of Hindus than in scheduled castes and tribes.
3. Education, particularly of the wife, had a positive association with family planning.
4. Family income was also positively related with contraception.
5. The practice of temporary methods was more among educated groups and higher income groups.

The Family Planning Foundation, New Delhi, had made a study in some selected states under the title 'Diagnostic Study of Population Growth, Family Planning and Development — 1971-81'. The reports were published in 1985. From these studies it is evident that literacy, electricity and road communication and health services infrastructure have a positive association with family planning acceptance. It can also be inferred from the state-wise statistics that developmental efforts have definitely helped in the promotion of contraception and the acceptance of the small family norm. In this context we may also refer to experiences in other countries, which establish the positive influence of rural development on fertility behaviour. (*Population Development Studies No. 9 and 10 of UNFPA and Policy Relevance of Findings of the World Fertility Survey for Developing Countries*).

SCOPE AND DIRECTION FOR THE FUTURE

There is no need for any pessimism or alarm about the rising population, offsetting the gains in any field of development. Decent and tangible progress has been made towards development; the only thing now required is proper prioritization and shift to ensure uniform and accelerated growth of the rural economy and a slowing down of wasteful and irrelevant expense on the urban side. With regard to family planning, the progress is admittedly slow and it is very glaring that enough awareness about family size limitation and available methods of contraception has not been created in the rural community.

Since enough evidence has accumulated to indicate a definite positive association of socio-economic development with fertility control (age at marriage, family size preference, and practice of contraception) there is need for a *co-ordinated effort to ensure that every adult is engaged in productive work and gainful occupation.*

The main thing to be remembered for some years to come is that the village is the backbone of society and, therefore, the focus should be on the rural areas with highest priority. Needless to say that the agriculture has to be diversified and expanded. Some of the important steps to be taken will be:

1. Land reforms for equitable distribution of land and removal of bonded labour, indebtedness, etc.
2. A country-wide inland water management system for conservation of water, permanent irrigation facilities and conservation of soil.
3. Improved technology for cultivation.

In the case of industrial development the following points have to be borne in mind:

1. It has to be more rural-based than at present. The idea of establishing poles of development around towns and cities should be given up.
2. Stress should be on agro-based industries.
3. Production should depend more on human energy and skill than on machines — production by the masses rather than mass production.
4. Production should be need-based and relevant for daily consumption and should not fall into the category of luxuries.
5. Export (from villages to cities or to outside countries) should not become a consideration for commercial purpose till enough has been produced for local needs.
6. Promotion and preservation of local artisanship and craftsmanship.

7. Promotion of poultry farming, processing of animal foods, fisheries, etc. at the village level.

Quality of life depends largely on health which in turn is influenced by a variety of socio - economic factors and also accessibility to health - care facilities. Besides increasing the employment opportunities and earning capacity, considerable attention has to be paid by the government to proper housing, water supply and sanitation in the rural areas. A huge bulk of the communicable diseases are bound to disappear if sanitation is improved.

Appropriate technology at low cost has been tried successfully in various parts of the country and also outside for the safe disposal of human excreta. While there used to be considerable resistance a few decades ago among rural folk to accept hand flush, water-seal latrines and bore-hole latrines, people now have started asking for latrines because in growing villages open space is also diminishing. The sludge in the latrine pits has value as manure; and gas plants using human as well as cattle excreta are also gaining popularity in the rural areas. Similarly, soakage pits and kitchen gardens have been found appropriate for disposal of waste water. The time is now ripe for having a nation-wide rural reconstruction scheme with focus on housing, sanitation and safe water supply. Human labour for such work can be had locally and a by-product would be the gainful occupation it would provide. For safe water, the recent experiences of UNICEF/WHO-assisted schemes of bore-wells with pumps have been quite cost-effective and feasible; the chances of contamination and wastage have been minimal. This scheme has to be implemented widely and rapidly.

In this context, it may be mentioned that India is one of the member countries of WHO to have endorsed the resolution at the Alma Ata Conference in 1978 of 'Health for all by 2000 A.D.' It has been agreed that there should be a proper inter-sectoral co-ordination to ensure that the development programmes are so dovetailed into one another that there will be a synergistic effect for a quick pace of total human development. It has also to be remembered that sanitation (including personal hygiene) and proper nutrition are the two most important things to be immediately improved in order to prevent more than 50 per cent of the prevailing diseases-communicable diseases and nutritional deficiency diseases — and to appreciably reduce the morbidity and mortality in infancy and childhood.

The accessibility of health services for curative and preventive care is another aspect requiring attention and the government has been doing its best in this regard by expanding the infrastructure. Enough awareness in the community has yet to be created to utilise these services.

Above all, education is the most vital area of development. It is through formal as well as informal education that the society can be made to understand how to live a better life and avail of appropriate technology for personal hygiene, environmental sanitation, health and family planning (besides agriculture and rural-based industry). As was pointed out by Dr. Karan Singh in his Sardar Vallabhbhai Patel Endowment Oration recently, primary education for all children is a must, and there should be a sizeable component of health education throughout schools and colleges. He also stressed the need for vocational education at the middle level to make education applicable for daily life and occupation, and for the rationalization of higher education again to make it relevant and useful for society. Needless to say that special attention is required for women's development through informal education in the villages.

With regard to the Family Planning Programmes, it may be said that the present strategy for implementation has to be drastically modified. There has been undue stress on sterilization at all levels of policy, planning, implementation and review. For bringing about a meaningful change in the demographic picture, the shift in the emphasis in the services should be on providing spacing methods for young couples. The target-oriented approach with campaigns and camps has resulted in mad competition among the peripheral workers in health as well as other departments for 'catching cases for sterilizations'. The programme, if it has to be enduring and to have clear impact on the birth rate, should evolve by systematic education. Studies have shown that the health staff themselves are lacking in knowledge about the different contraceptive methods and their attitude towards spacing methods is not yet positive, with the result that they have tendency to adjust their records without actually distributing condoms or pills or introducing the IUD (because verification is very difficult and delicate). The health staff require to be trained repeatedly by continuing education on two things — contraceptive methods and methods of communication and education.

It will be better for the government to put a stop to the payment of incentives and compensation money and to divert this huge (wasteful) expenditure to improving service facilities. Regarding incentives to staff, the question is why pay them extra when they are already paid salaries for doing their normal duties? Regarding compensation money to the clients, the idea was to compensate the loss of wages. This consideration needs to be shown only to the poorer section of the society. There was no need to have extended this facility to government employees and those in the middle and upper classes, who are granted leave of absence from work without having to lose their salary.

On the whole, the strategy should be based on proper education and counselling and with equal emphasis on all methods of contraception. The educational component should lay more emphasis on the health aspects, because it is very difficult for couples in the poorer sections of the community to perceive or experience the economic aspects. This has been well brought out in a recent study of the Indian Council of Medical Research (ICMR) done on a pilot basis in four centres to find out the positive and negative effects of family planning. The small families could not notice or appreciate any improvement in their economic status, whereas they clearly saw an improvement in the health of the children.

A twin approach of improving standards of living and intensive education and communication will successfully take care of the population problem. Repeated statements like, 'India adds to itself one more Australia every year' will be of no avail in carrying conviction to the minds of the masses. It will be more sensible and relevant, on the other hand, to drive home the importance of family size limitation and spacing between children for the health of the mother and the child.

REFERENCES

Family Welfare Programme in India, *Year Book* 1986-87.

India's Population: Demographic Scenario, Department of Family Welfare, Ministry of Health and Family Welfare, Government of India, New Delhi.

Year Book 1988, Competition Success Review, New Delhi.

Towards the Implementation of A National Nutrition Policy in India, Report of a National Seminar held in Srinagar on 28 and 30 October 1985, ICMR, 1986.

Schumacher, E.F., *Small is Beautiful*, London, Sphere Books

Toffler, Alvin, *Future Shock*, Bantam Books, 1971 *The Third Wave*, Macmillan India, 1981.

Khan M.F. and C.V.S. Prasad, *Family Planning Practices in India*, Survey, Operations Research Groups, Baroda, 1983.

Diagnostic Study of Population Growth, Family Planning and Development-1971-81, (U.P., Tamil Nadu, Gujarat, Rajasthan and Orissa), The Family Planning Foundation, New Delhi.

Impact of Rural Development Projects on Demographic Behaviour, Policy Development Studies, No. 9, UNFPA.

Population Growth and Economic Development. Lessons from Selected Asian Countries, Policy Development Studies No. 10 UNFPA.

Weinberger, Mary Beth, *The Relationship Between Women, Education and Fertility: Selected Findings from the World Fertility Surveys*, International Family Planning Perspectives, Vol. 13, No. 2, June 1987, Alan Guttmacher Institute, New York.

Policy Relevance of Findings of the World Fertility Survey for Developing Countries, I.N.E.S.C., A.P., 1986, ST/ESA/SER-R-59.

Women and Development

K. SARADAMONI

INTRODUCTION

The mid-seventies saw the beginning of a shift in attitude towards women's status in India. Women began to be seen as an integral part of development and not as beneficiaries of social welfare programmes and schemes. Words like 'women's development', 'women and/in development' 'women's role in development' came to be used frequently by government and other bodies. It cannot be said that their meaning is absolutely clear. However, the sense and message behind them are by now well-understood. In brief, they mean that women have not so far received their due share from the development the nation has achieved. They have also not had the opportunity to participate effectively in the development process as equal partners. Their contribution on the other hand has remained undervalued and unseen. To change this situation, women have to be specifically focused upon, and they should become both agents and beneficiaries of development. This change in perspective has been well reflected in the report submitted on 13 December 1974, by the Committee on the Status of Women in India (CSWI), constituted by the Ministry of Education and Social Welfare, Government of India on 22 September 1971 and in the celebration of 1975 as International Women's Year following a resolution passed by the United Nations General Assembly.

In 1972, the General Assembly, in its resolution 3010 (XXVII), proclaimed 1975 as International Women's Year, to be devoted to intensified action to promote equality between men and women, to ensure the full integration of women in the total development effort and to increase women's contribution to the strengthening of world peace. The World Plan of Action for the Implementation of the Objectives of the International Women's Year, adopted by the World Conference of the International Women's Year at Mexico City in 1975, was endorsed by the General Assembly in its resolution 3520 (XXX). The General Assembly, in that resolution, proclaimed 1976-85 as the United Nations Decade for Women: Equality, Development and Peace. In its resolution 33/185, the General Assembly decided upon the sub-theme 'Employment, Health and Education' for the World Conference on the United Nations Decade for Women: Equality, Development and

Peace, to be held at Copenhagen to review and evaluate the progress made in the first half of the Decade.

In 1980, at the mid-point of the Decade, the Copenhagen World Conference adopted the Programme of Action for the second half of the United Nations Decade for Women: Equality, Development and Peace, which further elaborated on the existing obstacles and on the international consensus on measures to be taken for the advancement of women. The Programme of Action was endorsed by the General Assembly in 1980 in its resolution 35/136.

Also in 1980, the General Assembly, in its resolution 35/56, adopted the International Development Strategy for the Third United Nations Development Decade and reaffirmed the recommendations of the Copenhagen World Conference (General Assembly resolution 35/56, annex, para 51). The strategy for providing importance to the participation of women in the development process, as both agents and beneficiaries, called for appropriate measures to be taken in order to bring about profound social and economic changes and to eliminate the structural imbalances that compounded and perpetuated women's disadvantages in society. The strategies contained in the World Plan of Action and in the Programme of Action were important contributions towards enlarging the perspective for the future of women.

In recent years the National Perspective Plan (NPP) for Women 1988-2000 A.D., adopted by the Government of India is also aimed at bringing about notable changes in the status of women¹.

This should not make anyone think that the status of women in society or their role in public life were not thought of earlier. There is plenty of literature on the social reforms movements that took place in various regions in the country during the early decades of this century and the concerns about women's education, widowhood, child marriage etc. were expressed at that time. 'Women and the freedom movement' is a topic on which research interest has not subsided. The National Planning Committee (NPC) set up by the Indian National Congress prior to independence had prepared one separate report on Women's Role in Planned Economy. In the introduction to the report, the editor of the series, Shri K.T. Shah wrote, 'the position of women in this country, no matter from what standpoint one considers it — social, economic, political or cultural, leaves much to be desired from the standpoint of those who believe in the fundamental equality of all human beings, and freedom of the individual as citizen or an economic unit'². Independent India in her commitment to usher in a just society as embodied in the Constitution accepted the principle of equality and included in article 15 the specific constitutional provision prohibiting discrimination on the ground of sex. At the same time it has

empowered the state to make special provisions for women and children. Equality of opportunity in public employment of all citizens without regard to sex, equality before the law and equal protection of the law are guaranteed by articles 14 and 16 of the Constitution. Several legal enactments and administrative decisions were made by the government to make the constitutional commitments effective.

Two decades later, the government felt the need for a comprehensive examination of all questions relating to the rights and status of women. It set up a committee to enquire into the status of women in India with broad terms of reference. The committee examined women's status from various angles including socio-cultural setting, law, rights and opportunities for economic participation, education, political participation, etc. The subsequent years saw a plethora of studies, reports, articles and books relating to women in the context of one or more of the above issues. A large number of them focused attention on women and development, particularly rural development. These enquiries began to explore hitherto neglected areas like definitions, concepts and methods of data collection, research and interpretation. They unearthed intra-household disparities between the sexes (woman and man, girl and boy) in matters of food, education, employment, etc., which got strengthened outside the domestic sphere. The important contribution of these studies was that they highlighted the need to focus specifically on women (who constituted fifty per cent of the population) in matters of development. However, the experience of women in many areas of life continues to be disturbing.

DEMOGRAPHIC FEATURES

Any discussion on this topic would refer to the adverse sex-ratio prevailing in our country. The CSWI noted that the decline in the sex ratio since 1901 was a 'disturbing phenomenon in the context of the status of women'. The reasons for this as given by demographers are (a) higher under-enumeration of females in the census, (b) higher mortality rate of women, (c) the marked preference for sons and the consequent neglect of female infants, (d) the lower status of women and the general neglect of women at all ages, (e) the adverse impact of frequent and excessive child-bearing on the health of women, and (f) the higher incidence of certain diseases in women. We do not have adequate and reliable data to substantiate any of the above points. However, the hypotheses singly and together influence the major issues covering women and development. Table 5.1 shows the sex ratio in our country since the beginning of the century.

Table 5.1: Sex ratio in India since 1901

<i>Year</i>	<i>Sex ratio</i>	<i>Year</i>	<i>Sex ratio</i>
1901	972	1961	941
1911	964	1971	930
1921	955	1981	933

Table 5.2 shows that the all-India pattern is also true in the states with the exception of Kerala. This was not unnoticed earlier. The editor of the NPC report had made the categorical observation that the decline in the numerical proportion of women several years after birth was due to the unwritten convention of the man-made social system in which a woman's life was held to be cheaper than that of a man³. Despite all these observations and a marginal improvement in the sex ratio between 1971 and 1981, there is no indication of a reversal of the trend towards change in the status of women. On the other hand the NPP published by the government admits that discrimination starts even before birth in the form of sex-determination tests, misusing the high technology of aminocentesis, resulting in a new kind of femicide, i.e., abortion of female foetuses⁴.

The adverse sex ratio and the explanations given for that do have an ideological implication. It has to be noted that the 'man-made social system' has successfully inculcated in women ideas which devalue their own lives and incline them to look towards man as the protector and someone superior. Differences are also seen based on class, caste, region and many other factors. This results in loss of self-esteem and self-confidence and influences their world view, behaviour and motivations. An overwhelmingly large section of Indian women are influenced by these ideas, and we have to keep this in mind while considering issues related to women and development.

ACCESS TO NUTRITION AND HEALTH CARE

In our country, where a sizeable section of the population do not have regular work, or steady income, or social security, and where a large number fall below the poverty line, it should not be surprising if many among them fall short of the necessary nutrition and health care levels. In the case of woman in particular, her reproductive function lends great importance to the issues of nutrition and health care. During

Table 5.2: Sex ratio in states and union territories of India, 1981

<i>India/State/ Union Territory</i>	<i>Total</i>	<i>Rural</i>	<i>Urban</i>
India^{1,2}	933	951	878
Andhra Pradesh	975	984	948
Assam	901	917	768
Bihar	946	963	832
Gujarat	942	959	905
Haryana	870	876	849
Himachal Pradesh	973	989	795
Jammu & Kashmir ²	892	897	875
Karnataka	963	978	926
Kerala	1,032	1,034	1,021
Madhya Pradesh	941	956	884
Maharashtra	937	987	850
Manipur	971	971	969
Meghalaya	954	965	904
Nagaland	863	899	688
Orissa	981	999	859
Punjab	879	884	865
Rajasthan	919	950	877
Sikkim	835	864	697
Tamil Nadu	977	987	956
Tripura	946	945	957
Uttar Pradesh	885	893	846
West Bengal	911	947	819

Contd. Table 5.2

<i>India/State/ Union Territory</i>	<i>Total</i>	<i>Rural</i>	<i>Urban</i>
Union Territory			
Andaman & Nicobar			
Islands	760	774	720
Arunachal Pradesh ³	862	881	629
Chandigarh	769	688	775
Dadra & Nagar			
Haveli	974	981	884
Delhi	808	810	808
Goa, Daman and Diu ⁴	981	1,013	919
Lakshadweep	975	986	963
Mizoram ³	919	928	893
Pondicherry	985	977	992

¹ Includes projected figures of Assam where census could not be held due to disturbed conditions prevailing there at the time of 1981 census.

² The population figures exclude population of areas under the unlawful occupation of Pakistan and China where census could not be taken.

³ Now a state

⁴ Now Goa is a state and Daman and Diu is a union territory

Source: Registrar General of India, reported in *Health Statistics of India (1985)*.

Central Bureau of Health Intelligence, Directorate General of Health Services, Ministry of Health and Family Welfare, Government of India, New Delhi.

pregnancy a women is required to consume at least 2500 calories per day, but an average Indian woman consumes barely 1400 calories. The shortfalls are found to be more marked during lactation. Poverty and the absence of sufficient economic means contribute to shortfalls in nutrition in general, but women experience this all the more because of the gender discrimination and the above-mentioned perception of the man-made social system. Giving men and boys better shares of food in terms of quantity and quality is a deeply entrenched idea among a large section of our women. This idea is equally strong in both types of household - where the total availability of food is sufficient or where it is less than what the members need. In poorer homes where the girls and women bring equal or more income (in cash or in kind) compared to men, they take less than equal not to speak of sufficient food even during pregnancy and lactation. The same girl who experiences discrimination at a tender age even in respect of food is burdened with domestic work and responsibility in helping the mother, taking care of the young, etc. No doubt all normal and desirable urges, zest and joy about life get crippled in her at that early age itself. She grows up without receiving adequate nutrition or health care and also without knowing that something is being denied to her or that it is her right to have it. The health status of these overworked and underfed women, who get very little rest, may be attributed to various reasons. The N.P.P. document has listed them as follows:⁵

- (i) Major disparities in health care in population groups in rural and urban areas, remote, backward, hilly and desert areas, and in socio-economically deprived groups;
- (ii) Social attitudes and prejudices inherent in our milieu, which are unfavourable towards girls and women;
- (iii) Poor health of women due to the synergistic effects of high levels of infection, malnutrition and uncontrolled fertility extending over a prolonged span;
- (iv) Inadequate basic health care facilities [including facilities for Maternal and Child Care (MCH), family planning, Medical Termination of Pregnancy (MTP) and nutrition] for women and children, in terms of outreach, range of services, quality, availability, etc;
- (v) Inefficient use of resources available for health care of women, resulting in a slower pace of health development for them;
- (vi) Ignorance and lack of knowledge related to health, nutrition and family planning, affecting self-help efforts in health and resulting in under-utilization of existing resources; and

- (vii) Absence or inadequacy of essential non-health facilities which affect health, such as potable water and sanitation, female education, food supply, etc.

In response to the NPP document, a group of women's organizations pointed out the following inadequacies in the health status of the people, which have direct bearing on the health status of women.⁶ These are:

- (1) Only 20 per cent of our people have access to modern medicine;
- (2) Almost 84 per cent of health-care costs are paid privately;
- (3) Only 33 per cent of deliveries are attended to by trained people;
- (4) Maternal mortality is 400-500 per 1,00,000 live births and figures from some rural areas are as high as 1,000-1,200. It is estimated that 1 in every 18 Indian women run a life-time risk of dying from pregnancy-related causes. The NPP itself admits that 70 per cent of these deaths can be prevented;
- (5) About 50 per cent of children and 65 per cent of women suffer from iron-deficiency, anaemia;
- (6) Only 25 per cent of children are covered by the immunisation programme and 13 million (3000 a day) children die of diseases which could have been prevented by immunization;
- (7) One third of the total population of India is exposed to malaria, filaria, and kalazar every year;
- (8) Over 5,50,000 people die of T.B. every year. About 9,00,000 people get infected by T.B. every year;
- (9) About half-a-million people are affected with leprosy, which is one third of the total number of leprosy patients in the world;
- (10) About 1.5 million children die due to diarrhoea every year;
- (11) A comparison of Infant Mortality Rates (IMR), [i.e. number of deaths under the age of one month per thousand live births] of some countries in 1960 and 1985 shows that many countries with a poorer or comparable record 20 years ago are today much ahead of India.

The NPP has also noted that women face a high risk of malnutrition, retardation in growth and development, disease, disability and even death at three critical stages in their lives, viz. infancy, early childhood and adolescence and the reproductive phase. In old age, they face threats of breast and uterine cancer and menopause-related problems.⁷

But there are facts about women's health which are not revealed by the usual statistics. Access to health care cannot be considered to be satisfactory even for women in the economically better-off households. A survey conducted in and around Calcutta has brought out some interesting facts⁸. A section of the middle-class women take advantage of the medical facilities offered to their employed husbands by their firms or offices. But in the same city there are conservative households which do not allow the women to avail of such benefits and cannot afford the expenses of medical care on their own. Some such households prefer to spend money on consumer goods than on women's medical care. This should not be taken as a unique feature of only that area where the study was conducted. Many educated and knowledgeable women would consult a doctor or take rest from their responsibilities only as a last resort. The nature of household work (non-stop and considered to be the woman's responsibility) is such that it is difficult for the woman and others to get used to the idea of her being ill or out of 'work' as far as managing the household work is concerned.

The situation in the lower-class households where women invariably go to work outside the home, is in no way better. Many agricultural women labourers whom the author has surveyed referred to cough, cold and body pain in a casual manner and showed a matter-of-fact attitude to sickness in general. Depending upon the availability of a primary health centre, dispensary or government hospital, they think of getting treatment only when the illness is prolonged. If these facilities are absent, they would go to a private practitioner who would not always be qualified. When such a practitioner is not available, they would even depend upon the chemist.

While considering the issue of women's health, the stress-related illnesses cannot be ignored. Overwork, the double burden of a job and household, suffering in silence, all these affect their nervous system. Apart from that, growing unemployment, drug abuse, alcoholism and increasing competition everywhere bring added tension within the household. This again affects women more than men. Unfortunately this remains an area which has not received the necessary attention. Two other important points merit consideration in this regard. The first is that women traditionally had the knowledge of local medicines, herbs and medicinal plants and remedies for many of the common ailments. With the large scale use of allopathic or 'modern' medicines, the woman's knowledge and skills have become obsolete, though caring of the sick continues to be primarily her job. The second is that women unwittingly become victims of modern medicines, as is the case of high-dose oestrogen formulations.⁹ The following observations made at a workshop held in Bombay in April 1981 to discuss women and health are worth recording here:

'Urbanisation has been responsible for the breaking up of some of the female networks and sources of information about healing and traditional remedies. In urban areas alongwith diseases caused by the environment in which families live, there is increasing evidence of another cause that leads to women being hospitalised. This is that a number of women voluntarily attempt to gain a hospital bed in order to get out of oppressive situations in the home and in the slums. Doctors from a totally different class background to that of the working-class women in urban slums, treat the women by doling out tranquillizers, displaying a complete lack of understanding of the factors responsible for conditions of stress and ill-health¹⁰.'

Summarizing the health situation of women, the NPP document points out that major disparities in health care prevail among women (people) of rural and urban, developed and remote, backward, hilly or desert areas and also among those belonging to different socio-economic groups. Other factors they list include social attitudes and prejudices, inadequate health care facilities, inefficient use of resources available for health care of women, ignorance, and absence or inadequacy of essential non-health facilities which affect health such as potable water, sanitation, female education, food supply, etc.

MATERNITY AND CHILD CARE

These are closely related to women's health and status. The CSWI noted that the maternal mortality rate was high enough to raise the overall female death rates and accounted for the unfavourable sex ratio. Many studies of the mid-seventies have pointed out that much of pregnancy loss and pre-natal mortality result from premature births and malnutrition. Frequent pregnancies resulting in protein malnutrition and nutritional anaemia cause a large proportion of maternal deaths. The situation has not improved during the last fifteen years. As mentioned earlier, the NPP document states that a woman in the subcontinent runs a life-time risk of 1 in 18 of dying from a pregnancy-related causes. Anaemia, haemorrhage, toxemia, sepsis, and abortion are listed as the major causes of maternal deaths (See Table 5.3).

Child care is a major responsibility and cause of concern for women. In our country it is mainly a private affair, and the class-differences in our society are reflected in this as in most other aspects of life.

Table 5.3 Percentage of deaths by causes related to child birth and pregnancy (maternal) 1976-83

<i>Specific causes</i>	<i>1976</i>	<i>1977</i>	<i>1978</i>	<i>1979</i>	<i>1980</i>	<i>1981</i>	<i>1982</i>	<i>1983</i>
Abortion	11.6	8.2	11.0	11.7	12.5	13.7	10.1	10.7
Toxaemia	10.4	11.2	21.2	16.1	12.4	8.0	12.5	12.1
Anaemia	22.1	15.9	14.6	15.0	15.8	17.7	24.4	18.9
Bleeding during pregnancy and puerperium	17.2	20.6	18.2	20.0	15.8	23.4	26.2	23.8
Malposition of child leading to death of mother	8.6	9.4	9.5	10.5	13.4	9.2	7.2	8.3
Puerperal sepsis	13.5	18.8	12.4	11.7	12.4	13.1	8.3	11.6
Not classifiable	16.6	15.9	13.1	15.0	17.7	14.9	11.3	14.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Sample No. of deaths	163	170	137	180	209	175	168	206
Percent of total deaths	1.1	1.0	1.0	1.1	1.2	1.0	1.0	1.0

Source: *Survey of Causes of Deaths (Rural) 1980, 1983-Report*, Registrar General of India

But even women from well-to-do households face problems in the absence of creches and similar facilities to suit their convenience and to their satisfaction. Women have started feeling the pinch of the disappearance of the joint family without the creation of alternate support systems. Many middle class women who are employed, try to cope with the situation by employing young women from the lower class. But this cannot be considered to be a perfect arrangement, as the young women are not trained for this task. Today's child grows up in a world which is becoming both complex and hazardous and the child needs much more than food, toys and clothing. Unfortunately, we have not yet come to realize the meaning and content of child care in the fast changing surroundings.

The situation is depressing when it comes to poorer households. Even in establishments which are legally required to provide creches, only a very small number of them do so; and even there the ladies of the poorer sections are not able to utilize the facility. The case of those women who work in the unorganized sector, often as household producers or as landless agricultural labour is even worse. It is with the help of a wide network of elders — parents of wife or husband, disabled husband, old or invalid uncles, aunts, unmarried sisters, elder children, other relatives and neighbours — that most of these women manage to take care of their children.¹¹ In author's survey of agricultural labourers, some very pathetic facts emerged. One cannot use the word 'child care' in their case. There were cases where the women left the baby on a mat with the neighbours who were equally poor and ignorant. Most of the women looked for work nearer home so that they could come home to feed their babies. In a Tamil Nadu village many of the respondents took their babies to the field and kept them in temporary cradles hung on trees. Some women said that they took permission from the landowner to come home to feed the baby. In some cases the elder children or elder women took the baby to the field to be fed. One or two women in Kerala said that they would leave tea or kanji (cooked rice with water, in this case water taken out after boiling rice) to be given to the babies. Maternity and child care are directly linked with their work status. There were respondents who said that they worked till the 'pain started' so that they could 'save something for delivery'. When they would resume work, depended upon the availability of someone to look after the baby. Some looked for work within weeks and fortnights of the delivery. Some women who did not have any help stayed away for a year or more.

FAMILY PLANNING

The underlying idea behind family planning policies in India, whether it is explicitly stated or not, is that population growth has to be checked so that the benefits of development and economic growth could be made available to the larger numbers. However, family planning is not merely a set of techniques which is getting wide publicity through the media. Betterment in economic well-being and the vision of a morrow which is more secure and hopeful, are necessary for the success of the family planning programme. It can fully realize its objectives when there are changes in social attitudes (like preference for boys), social practices (like expensive marriages) and improved opportunities for education and employment. There is an urgent need for exposure to different or new way of thinking about oneself and ones surroundings.

Whereas the emphasis on the implementation of the family planning programme (now popularly known as the family welfare programme) is crucial in the context of the development of the nation and the quality of life of the people, it is often observed that various measures for attaining the targets are thrust upon women more than men. Here also the women are to come forward. There are some other problems too. The programme is aimed at rapid reduction of birth rate and does not show adequate concern for the health of women or for medical practices currently prevalent in the country. Moreover, the report on the workshop held in Bombay in April 1981 states, '... in India where women have few rights within an oppressive patriarchal system, women displayed a keenness to obtain contraception, often using it secretly without the knowledge of men. Thus the use of *Depo-Provera* or similar drugs has proved to be popular as it is the only contraception which can be used without the knowledge of family'.¹² All this show that family planning is more complex than what is made out in the media and by the concerned authorities. The massive propaganda, particularly through television that 'all methods are safe' is something to be considered carefully. It is hard to believe that such standard advice can be given to women and men who belong to different cultures, socio-economic backgrounds, and living levels, with varying levels of food intake, education, etc. More research should be done in this area and the public should be informed of the results. Research is also necessary on the traditional methods of controlling or spacing pregnancy, which our women have been using. The emphasis on sterilization and other methods of controlling or spacing pregnancies, the practice of making women the targets of policies and the possible effects of these on mothers and nursing mothers have been noticed by researchers who have sounded notes of caution regarding insensitive and indiscriminate policies and methods.¹³

EDUCATION

The role of education in human resource development for nation-building and development can hardly be over-emphasized. However, our achievements in this respect in the last forty years are not encouraging. This is evident from the Tables 5.4 and 5.5. Our literacy levels for both men and women have grown from what they were at the beginning of the century. The percentage of literate men has risen from 9.8 to 46.9, and women from 0.7 to 24.8. In Table 5.5 we have literacy levels of women alone under different age groups and in rural-urban situations. If we examine literacy levels of various states and within the states under different socio-economic groups, the findings would be more disturbing.¹⁴ With a female literacy rate of less than twenty five per cent we cannot expect a brighter picture for women when we look at educational levels (Table 5.6). Women lag behind at the stage of enrolment and their drop-out rate is higher. The following are invariably given as the reasons for lower enrolment and retention for females in educational institutions.

Table 5.4 Literacy (Percentage of Literates) in India, 1901-81

<i>Year</i>	<i>Total</i>	<i>Male</i>	<i>Female</i>
1901	5.3	9.8	0.7
1911	5.9	10.6	1.1
1921	7.2	12.2	1.8
1931	9.5	15.6	2.9
1941	16.1	24.9	7.3
1951	16.7	25.0	7.9
1961	24.0	34.4	13.0
1971	29.5	39.5	18.7
1981	36.2	46.9	24.8

Table 5.5 Literacy rates for women (rural-urban) in four age-groups, 1971 and 1981

Age group	1971			1981		
	Total	Rural	Urban	Total	Rural	Urban
All groups	18.70	13.08	42.05	24.82	17.96	47.82
5 +	21.95	15.40	48.73	28.47	20.65	54.41
10 +	22.60	15.81	49.94	28.99	20.86	55.48
15 +	19.32	12.88	45.42	25.68	17.57	51.88
35 +	10.75	6.47	30.18	14.44	8.62	35.19

Sources : Census of India 1981 Series-I, India Paper 2 of 1983.

See *National Perspective Plan for Women - A Perspective from the Women's Movement*, op. cit., p. 19.

(i) older girls are needed at home to take care of siblings, when mothers go out to work; (ii) girls start to work early in the life to add to the family income; (iii) early marriage; (iv) social customs and practices like restricting mobility after puberty; (v) lack of relevance in the school curriculum; and (vi) absence of facilities in the form of school buildings, hostels, women teachers, etc¹⁵.

While this continues to be the experience in large areas of our country and for large numbers of our women, a small section, mostly urban and belonging to upper class, have succeeded in taking advantage of the opportunities for higher and professional education/research training, particularly after independence. However, it has to be remembered that their number is insignificantly small. According to statistics put out by the Ministry of Human Resource Development, for every 1,000 boys enrolled at the primary level, 671 girls were enrolled. At the middle-school level the sex ratio came down to 551 and at the higher secondary level it further fell to 390. There was a favourable sex ratio in respect of teacher training, where there were 1,065 female pupil teachers per thousand male pupil teachers. In medical courses the sex ratio was 429 females per 1000 males and in courses like engineering and architecture it fell to 66¹⁶.

Table 5.6 Enrolment ratio-elementary classes, 1984 - 85

<i>Year</i>	<i>Classes I-V</i>		<i>Classes VI-VIII</i>		<i>Classes I-VIII</i>	
	<i>Total</i>	<i>Girls</i>	<i>Total</i>	<i>Girls</i>	<i>Total</i>	<i>Girls</i>
1950 - 51	42.6 (191.55)	24.61 (53.85)	12.9 (31.20)	4.5 (5.30)	32.4 (222.75)	17.4 (59.15)
1955 - 56	52.9 (251.67)	32.4 (76.39)	16.5 (42.93)	6.6 (8.67)	42.5 (294.60)	22.5 (85.06)
1960 - 61	62.4 (349.94)	41.4 (114.01)	22.5 (67.04)	11.3 (16.30)	48.7 (416.98)	30.9 (130.31)
1968 - 69	78.1 (543.68)	59.6 (202.11)	33.5 (125.36)	19.4 (35.47)	82.5 (669.04)	46.5 (237.58)
1973 - 74	77.0 (612.55)	59.9 (231.09)	32.8 (139.50)	21.0 (42.97)	61.6 (752.05)	46.5 (274.06)
1979 - 80	83.6 (709.43)	65.9 (271.81)	40.2 (194.83)	27.7 (65.28)	67.2 (904.26)	52.0 (337.09)
1984 - 85	94.1 (839.32)	76.7 (331.93)	50.6 (261.53)	36.3 (90.68)	78.3 (1,100.84)	61.9 (422.61)
<i>Project</i>	<i>891.38</i>	<i>432.71</i>	<i>516.61</i>	<i>249.94</i>	<i>1,407.00</i>	<i>682.64</i>
<i>Population</i>						
<i>1984-85 (in lakhs)</i>						

Note : Figures in parentheses indicate actual enrolment in lakhs.

Source : Five Year Plan Documents.

Education, and particularly higher education, is beyond the reach of many, but when it comes to women the social attitude towards women's status and role acts as an inhibiting factor. The dominant idea which persists amidst the Indian society including among women—is that woman's first place is the home. The education system is not free from this idea either. A highly respected person like Dr. S. Radhakrishnan has gone on record to say that home-making was the 'greatest profession' for women. These ideas not only influence the curriculum, sex-typing in courses, attitude and behaviour of teachers, but also narrow the boundaries of women's own vision about themselves and their lives. These have allowed many biases against women to enter the textbooks. A conscious effort to identify these biases and eliminate them has been made only recently. The pioneering work of the National Council of Educational Research and Training in this respect cannot be ignored. But the job is not yet over. Wrong, distorted and derogatory statements about women and other groups like scheduled castes and scheduled tribes and 'minorities' are not uncommon in the textbooks used in many parts of the country (though regional variations are pronounced in this regard). There is an urgent need to scrutinize these books carefully so that the biases can be detected and eliminated. Simultaneously, new books with a positive image of women have to be written and introduced in schools.

However, these measures should not be expected to radically alter Indian women's literacy or educational status immediately. While the National Policy on Education (NPE-1986) in its section titled 'Education for Women's Equality' states the objective to use education as 'an agent of basic change in the status of women', factors like increasing privatization and the rising costs of education have already started pushing out women. The masses will take advantage of education only when it is within their reach in every sense. The experience of Kottayam town in Kerala, where a hundred per cent literacy was attained in a short period by popular involvement, is a good lesson for others. Such effort can be made use of, not only to spread literacy, but also to educate women in population issues, health and hygiene, maternity and child care, legal matters, ecology and environment issues, and science and technology. However, non-formal ways of imparting knowledge cannot be treated as a substitute for formal education.

ECONOMIC ACTIVITY

Women and work and women and employment are two topics on which much material is available. Many of these studies analyze the census and National Sample Survey data. Tables 5.7 and 5.8 give an idea of the type of information available in

Table 5.7 Crude work participation rates - All India, 1971 - 81

	Rural		Urban	
	Male	Female	Male	Female
Main Activity				
1971 Census	53.60	13.36	48.80	6.65
1981 Census	52.62	16.00	48.54	7.28
1977-78 NSS	62.25	28.82	56.29	13.81
Modified main activity (including marginal workers)				
1972-73 NSS	63.84	35.53	57.09	15.53
1977-78 NSS	64.06	38.48	57.48	17.80
1981 NSS	53.80	23.18	49.07	8.32
1983 NSS	63.23	38.74	57.71	17.13

Sources: (i) Census of India, 1981, Series I, India, Primary Census Abstract, Delhi, 1983.

(ii) NSS, Sarvekshana, April 1986, p. S-III

Table 5.8 Age specific worker participation rates, 1971 and 1981

Age Group	Rural Males		Rural Females		Urban Males		Urban Females	
	1971	1981	1971	1981	1971	1981	1971	1981
0-14	7.56	6.30	3.05	3.53	2.75	2.46	0.82	0.88
15-19	62.31	58.19	18.80	22.77	28.32	31.54	5.51	6.19
20-24	86.56	82.71	20.58	24.29	67.49	63.45	9.54	9.29
25-29	95.45	92.79	22.16	26.14	90.54	86.78	11.68	12.17
30-39	97.61	96.71	23.78	28.45	95.45	94.93	13.11	15.14
40-49	97.62	96.71	24.43	28.90	95.15	95.40	14.53	15.34
50-59	95.50	94.08	21.08	23.94	87.85	86.86	12.71	12.42
60 +	77.52	67.59	11.19	11.29	55.35	47.49	6.46	5.75
All Ages	53.62	52.62	13.36	16.00	48.80	48.54	6.65	7.28

Source: Census of India, 1981, Series I, Paper 2 of 1983, Key Population Statistics Based on 5 per cent Sample Data, Delhi, 1983, Table 15.

them. There are also reports and studies based on primary data, which together bring out various aspects of women's work outside the home¹⁷. It has been found that by-and-large women are working most of the time they are awake, yet that is not generally seen or recorded as work. Women themselves do not get counted as workers. According to the census of 1981, out of 1,000 women 140 were recorded as main workers, 58 as marginal workers and 802 as non-workers. However, one can appreciate the role of women and their economic activity better if one considers what women in general do and not merely what women 'workers' do. Women, it has already been pointed out, cannot be treated as a homogeneous category. Class and caste differences, variations in climate and crop production, land distribution, general economic level of the household, openings available in the area, presence or absence of adult earning males in the family, availability of some help in sharing the domestic work and responsibility, demands from the domestic front, and various other factors influence a woman's decision and ability to seek work outside the home. Since education and skill decide the level at which one can enter the labour market, most women are engaged in low-skilled and low-waged work.

In the organized sector, teaching and medicine are two areas which first absorbed women and they continue to be the areas where the maximum number of women are employed even now. Women have entered the administrative and other services, and many professions, including those areas which need high levels of scientific and technological skills. We have women pilots. Recently a young woman in Bombay was recruited as an engine driver in the railways. But it is pertinent to note that the number of these women is insignificantly small even when compared to the number of women who have had the benefit of education. The observation made in the NPP is significant in this regard. It states: "The organized sector in India (which consists of public sector and non-agricultural private sector establishments) absorbs less than one-eighth of the actual work force of the country. Of this, the share of women as of 1978 was 12.4 per cent. The number of women job seekers through employment exchanges rose from 11.25 lakhs in 1975 to 50.98 lakhs in 1986. The percentage of placements on the other hand increased from 1975-1982, but declined in the subsequent years i.e. 1983-1986"¹⁸.

However, the majority of women are to be found in the vast rural and urban unorganized sector. According to an estimate by the National Commission on Self-Employed Women, 94 per cent of the total female work force operates within this highly exploited sector. Employment in this sector is characterized by intermittent work and irregular income, low pay, long hours of work, low skills, absence of security and abysmal state of facilities like health, maternity and child-care. They include agricultural workers, all those who are engaged in traditional arts and crafts including handloom, bidi, coir, and other newly emerging works.

A more realistic estimate of the status of women can be made, if we examine the domestic sphere which is believed to be the women's world and their prime concern. Except for a very small minority, all women who go out of home to work, bear the responsibility for the household work as well. In the section on education we saw how the society's ideas about women's role and place affect their educational career. It does not end there, but affects their work outside home as well. They are treated as supplementary and secondary earners and this affects the wages they get even for the same work they do along with men¹⁹. Educated and professional women are not free from the adverse effect of this bias. Even highly qualified women candidates are asked questions about marriage and family while they appear for interview. Similar questions are not put to male candidates. Poor women, with insufficient household income, stretch their day to bring in some additional income by collecting grass, fuel, cow-dung, etc. in addition to cooking, cleaning, caring for the children and elderly, drawing water, etc. We have plenty of empirical evidences to show that their income is crucial to the sustenance of the family, that female-headed households are increasing in number, and that intra-household disparities between women and men persist as regards the access to food, clothing, health care, employment and education.

Though the household is considered as a unit for data collection, the family is left to be studied by the sociologist. It has been observed quite often that the sociologists' findings are seldom used in planning and development. It is imperative that planners take note of the domestic sphere and consider not only the time spent by women and men in various activities—'domestic chores' and others—but also the interlinkages between the domestic sphere and the wider socio-economic system. This would reveal the severe constraints under which women function. The removal of these constraints alone would make women independent and equal partners in development.

LAW AND MEDIA

The two other important factors with great potential for liberating women from many of their bindings, are the law and the media. In addition to the constitutional guarantees, a series of legislations have been passed—for instance the changes in personal laws, criminal laws, and labour laws, amendments to the Dowry Prohibition Act, rape law, Equal Remuneration Act, Prevention of Immoral Traffic Act, and the Indecent Representation of Women (Prohibition) Act. From reports about dowry deaths, rapes and atrocities on women, it is obvious that implementation of these legislations is ineffective or faulty. In spite of the level of education and an awareness of these legislations on the part of women themselves,

they are not in a position at present to take advantage of the legislations. The cinema, advertisements and stories in some glossy and cheap, widely-read magazines often play a negative role in their portrayal of women. However, the portrayal of women as self-confident, forward-looking individuals with social consciousness and concern, and the recent portrayals on television about the worth of women's work and the need to give special care to the girl child are welcome developments. We have to remember that our country is big; and development that has so far taken place is uneven. To give one example, even though the Child Marriage Restraint Act has been on the statute book for years and has recently been amended to raise the permissible age of marriage for both boys and girls, in states like Orissa, Madhya Pradesh, Uttar Pradesh, Bihar and Rajasthan, child marriages still continue.

CONCLUDING REMARKS

In this chapter we have tried to raise some important issues concerning women and development. This is an area on which plenty of reading material is available. *The Report of the Committee on the Status of Women in India* (1974), the *National Perspective Plan for Women 1988-2000 A.D.* (1988), the *NPP—A Perspective from the Women's Movement* (1988) and the *Report of the National Commission on Self-Employed Women* (1988) give voluminous data for anyone interested in examining the questions dealt with here. These are in addition to the large number of articles in newspapers and journals, research reports, books and theses. Many bibliographies have appeared on the topic of women and development.

We have seen that the issues around women and development cannot be even discussed effectively by employing many of the currently used categories and concepts. The rethinking that is needed will bring to light hitherto hidden or ignored realities about women's life, work and contribution as well as the ideology and values that influence their self-perception and world-view. This would simultaneously expose the limitations of our present understanding on the basis of which we not only formulate national plans and schemes for development and change but also take decisions at the individual, family and societal levels. The experience of the last ten to fifteen years gained from studies focused on women, prompt us to change our understanding of the issues related to the status of women in the national and global perspective, an issue which is gradually becoming more complex.

REFERENCES

1. Government of India, *National Perspective Plan for Women 1988-2000 A.D.*, New Delhi, Department of Women and Child Development, Government of India, 1988.
2. K.T. Shah (ed.), *Women's Role in Planned Economy*, National Planning Committee, Indian National Congress, 1947, p. 18.
3. *Ibid*, p.18.
4. Government of India, *National Perspective Plan for Women 1988—2000 A.D.*, *op. cit.*, p. 98.
5. *Ibid*, pp. 100-11.
6. *National Perspective Plan for Women—A Perspective from the Women's Movement*, 1988, pp. 130-131.
7. Government of India, *National Perspective Plan for Women 1988-2000 A.D.*, *op.cit.*, pp. 97-98.
8. Maithreyi Choudhury, 'Disparities in Food, Nutrition and Health Care—A West Bengal Picture', Unpublished paper presented in the Annual Conference of the Society of Regional Disparities, CFTRI, Mysore.
9. Some women's groups and the Voluntary Health Association of India played a significant role in bringing the harmful effects of these medicines to light. However, these efforts were made in big cities only. It is still not known to women at large, who are the users of these types of dangerous medicines.
10. Miranda Davis, (ed.), *Third World-Second Sex*, Zed Press, 1983-pp. 21-22.
11. This is based on the observations of the author while conducting the study, *Women and Rice Cultivation in the State of Kerala, Tamil Nadu and West Bengal*.
12. Miranda Davis, (ed.), *op. cit.*, p. 223.
13. Neera Desai and Maithreji Krishan Raj, *Woman and Society in India*, Ajanta Publications, 1985, p. 238.
14. If we examine pockets like tribal or fishing villages, the situation will be the same even in Kerala, the state where the average literacy and enrolment rates are high.
15. Government of India, *National Perspective Plan for Women 1988—2000 A.D.* *op. cit.*, p. 69.
16. *National Perspective Plan for Women—A Perspective from the Women's Movement*, *op. cit.*, p. 21.
17. K. Saradamoni, (ed.), *Women, Work and Society*, New Delhi, Indian Statistical Institute, 1985, pp. 275 - 308.
18. Government of India, *National Perspective Plan for Women 1988-2000*, *op. cit.*, p. 25.
19. K. Saradamoni, 'Statistics on Employment of Women', presented in the *Seminar of Social Statistics*, C.S.O., Government of India, 1988.

SECTION - IV
ENVIRONMENT AND RESOURCES

Population Environment and Resources

C.K. VARSHNEY

STATUS OF ENVIRONMENT VIS-A-VIS POPULATION EXPLOSION

India is the second most populous country in the world. According to the 1981 census the population of the country was 685 million, which crossed the 800 million mark in 1988. Every year an additional 17 million babies are born. At the current rate the population will grow to one billion by the turn of the century and this number will double by the year 2035. In all probability India will overtake China as the most populous country on the earth in the next four decades.

Today India accounts for 15 per cent of the world population while its land area constitutes only 2.4 per cent. The per capita availability of land in the country is 0.48 hectares as against 4.14 hectares in the USA and 8.43 hectares in the USSR. The man-land ratio in relation to arable land is only 0.27 hectares and it is likely to reduce further in the coming years. Already India is twice as densely populated as China, putting heavy pressure on the environment, resources infrastructure and basic services. Providing basic human needs for such a large population will continue to remain a major task. The needs of the rapidly growing population are likely to overtake the ability of the nation to provide essential services like health care, education, employment opportunities, housing etc. There is chronic shortage of safe drinking water both in rural and urban areas, about 20 per cent of the urban and 50 per cent of the rural population is still to be provided with safe drinking water.

Urbanisation, a phenomenon closely related with burgeoning population, has swallowed up approximately 1.5 million hectares of agricultural land in the past 30 years. In addition 1.3 million hectares of forest was lost each year during 1975-82. The shortage of housing is an ever growing problem. Over one-fifth of the urban population lives in slums. In Bombay, Delhi and Calcutta about 30-40 per cent of the population resides in slums. Many of the problems experienced in accommodating a growing family in a one-room house on a small plot are analogous to those posed by expanding population. The size of the earth is fixed and its resources are strictly finite. Demands upon natural resources expand rapidly while their per capita availability decreases progressively, damaging the natural resource base.

The consequences of environmental degradation and resource scarcity hit the poor most severely. To stay alive these people destroy the very resources they will need tomorrow. The resultant damage to the environment only deepens their poverty. The vicious circle of poverty and environmental destruction is at work. The 'scissors effect' of poverty and increasing population slices away their ability to sustain human life. The victims of poverty destroy forests for fuel-wood, food, water and fodder and the growing population forces them to farm marginal land at non-sustainable levels. The excessive resource exploitation combined with a poor understanding of the interrelationships between man and environment has thus led to ecological crisis. Soil erosion and land degradation, deforestation, the fuelwood shortage, problems of water management, excessive population pressure on land and other environment-degrading trends inhibit the pace of economic development.

The mounting problems of pollution consequent upon unimaginative interference of human beings with nature have been adversely affecting the quality of life. Pollutants may be regarded as resources at the wrong place, but as such they represent a continuous drain on resources, apart from their disruptive or degrading impact on air, soil and water. However, the harsh reality of the environmental crisis – shrinking of forests, increasing desertification, degradation of critical resources, loss of agricultural land, salinisation, alkalisation and waterlogging, acidification of the environment and release of hazardous waste – has created environmental awareness among planners and policy makers. Building environmental concerns into development is now regarded as making efforts for sustained life and for avoiding the imminent death trap.

Sustainable Development

The concept of sustainability has emerged as a key issue in development planning very recently. The Stockholm Conference on the Human Environment 1972 and the International Conference on Population held in 1984 at Mexico City reflected concern for sustainable development. The International Planned Parenthood Federation (IPPF) and the International Union for Conservation of Nature and Natural Resources (IUCN) have also stressed this approach to development. The recent (1987) report of the World Commission on Environment and Development, headed by the Norwegian Prime Minister Mrs. Brundtland has used it as a key concept.

The need for sustainable development presupposes that the present development is not sustainable, and hence it is urged to opt for a new approach to development.

There is need to integrate population, environment and natural resource policies into national development strategies so as to ensure environmentally sound sustainable development. The major emphasis of this approach is on meeting the basic needs of the people and improving their quality of life without adversely affecting the viability of the environment. It requires development strategies which anticipate environmental problems and take precautionary measures to avoid the resultant problems.

However, the goal of sustainable development is not likely to be attained unless the implications of interrelationships among population, environment, resources and development are adequately understood and appreciated by the people of the country. It is urgently required to remove the insularity of perception of growing degradation of environment and critical resources in the context of rapid population growth and the process of development. This is possible when a proper understanding of environmental problems and their possible solutions is developed. An attempt, therefore, is being made in the following pages to discuss major environmental problems such as deforestation, soil erosion, flooding, excessive ground water exploitation, threat to wild life, use of chemicals and pesticides, unimaginative mining water, ocean and air pollution, acidification, green house effect and ozone depletion. The efforts to improve the quality of environment and the issue of conservation and utilization of natural resources have also been delineated.

Deforestation

Forests represent a well organised and highly evolved community of plants and animals. They provide several products of daily use such as food, timber, fire-wood, wood pulp, forage and fibre, apart from being a vast store house of medicinal plants which are yet to be fully explored and exploited. They are potent sources of many industrial raw materials. The greatest significance of forests, however, lies in their critical role in maintaining ecological processes and life support systems.

According to official records 23 per cent of the land in India is classified as forests. The National Forest Policy of 1952 recommended that 33 per cent of the land area of the country should be under forests. Contrary to this guideline, however, forests have been under increasing assault since independence. It has been estimated that 1.3 million hectares of forests are lost every year. Land under forests shrunk from 46.42 million hectares in 1972-75 to 33.77 million hectares in 1980-82. At present not more than 10 to 12 per cent of the land is estimated to be under forest cover.

Excessive exploitation of forests and overgrazing by cattle have seriously decimated our forest resource. The denudation of the Himalayan and other hilly areas has led to soil erosion which affects river water quality, apart from inducing rapid siltation of dams and reservoirs. Degradation of forests leads to the destruction of wild life habitats. Over a hundred species of wild animals need immediate protection, as their populations have dwindled to dangerously low levels. Moreover, many plants have suffered from deforestation and destruction. In a recent list prepared by the Botanical Survey of India there are 135 species of plants that need immediate care for their continued survival.

Deforestation also greatly increases the workload of local communities. Women and children, in particular, are forced to bear the burden of collecting fuel, water and food. A study in Almora reveals that because of indiscriminate deforestation the agricultural production, which was once sufficient, now feeds the villagers only for seven months in a year, as soil productivity has diminished and population has grown. Fire-woods and water have to be hauled from longer distances, because forests have shrunk and the springs in the neighbourhood, once abounding in sparkling fresh water, have dried up. Pre-occupation with fire wood collection and hauling of drinking water leaves little time for the villagers to address themselves to other activities essential for socio-economic development and improvement in their quality of life.

Soil erosion

Soil is the essential medium for the growth of plants. Management and improvement of soil fertility is vital for agricultural production and economic prosperity. But the pressure of the growing human and cattle populations has seriously affected the soil resources. The total cultivable land area in India is about 304 million hectares. According to an estimate made by the Ministry of Agriculture in March 1980, as much as 175 million hectares of this land area is suffering from environmental degradation. Deforestation, overgrazing, unscientific agricultural practices and desertification have induced soil erosion.

In Rajasthan, where only 20 per cent of the land is suitable for rainfed cropping, the mounting population pressure has doubled the area under cultivation from 30 per cent in 1951 to 60 per cent in 1971. This has happened mainly at the expense of grazing land necessary for pastoral agriculture which is the main occupation of a large section of the population in the state. With the population density already twenty times that of arid lands elsewhere in the world, the pressure of the growing population has led to various kinds of environmental implications. More land being

brought under cultivation, a decrease in grazing land, deforestation caused by rising demand for fuel and fodder, mounting pressure on land for house construction and other related developments have increased the desertification of western Rajasthan. This problem has been aggravated by wind and water erosion, water-logging, saline and alkali soils, primarily because of over-straining of the land resources.

Soil degradation has serious economic and ecological implications for a country like India which has a predominantly agricultural economy. For example, nutrient losses caused on account of NPK (Nitrogen, Phosphorus, Potassium) alone represents a loss of Rs. 700 crores per annum (Kanwar, 1972). Moreover, stream bank erosion and shifting of river courses through silt deposition by flood-prone river systems affect the land use pattern. Soil erosion increases the silt load in a river system affecting aquatic productivity diversely and results in speedier siltation of dams and reservoirs. Siltation of dams reduces their effective life span (Kanwar, 1980), a factor which has serious economic and ecological implications.

The practice of shifting cultivation, adopted in hilly areas covered with forest, has been a major cause of soil degradation. It is popularly known as the *Jhum* cultivation. It involves clearing of the forest by burning and using the cleared area for cultivation. But on such fields cultivation is possible only for 3 to 4 years, after which the area is abandoned, as the soil fertility goes down. Thereafter a new forest area is cleared for cultivation. The abandoned area is used for regenerating the forest so that soil fertility is restored. In the past the cycle of this process used to take considerably longer duration. Since the population of the *Jhum* cultivators was small, it took about 600 to 1000 years or more to return to the same land for cultivation. But now a days the duration of the *Jhum* cycle has been drastically reduced, mainly because of the needs of the rapidly growing population on those areas. Currently, only after every 4 to 10 years the same land is brought again under the *Jhum* cultivation. The reduced *Jhum* cycle is inadequate to recuperate the soil fertility. The continuation of the *Jhum* cultivation, therefore, is increasingly promoting land degradation.

Flooding

On account of deforestation, tampering with nature, uncontrolled grazing in the catchment areas and soil erosion, floods have become a recurring phenomenon in many parts of the country. According to the report of the National Commission on Floods (1980) the total area affected by annual floods has doubled since independence. While in the 1950s and 1960s three-fourths of all flood damage took place in five states (Uttar Pradesh, Bihar, West Bengal, Orissa and Assam), since the mid-seventies half the damage has been occurring outside the traditional flood zones. Loss of human lives and livestock as well as economic losses and damages to

property are escalating steadily. The average economic loss due to floods during 1971-78 was nearly Rs. 1000 crore annually.

In the absence of proper land-use planning, floods have become increasingly devastating over the years. Moreover, the pressure of population growth forces people to encroach upon flood plains. The disastrous impact of floods magnifies as the size of the population inhabiting flood plains and river banks increases.

Excessive Ground Water Exploitation

Ground water or aquifer is another major natural pool of fresh water that has been exploited by mankind from time immemorial. Ground water is periodically recharged by the rain water that seeps through the soil. It represents an important decentralized source of water supply which is available round the year. The total annual exploitable potential of ground water in the country is estimated at 2.3 m ha m (million hectare metre) of which only 10 m ha m is being exploited at present.

Ground water exploitation for agriculture, industry and human consumption is rapidly increasing in many parts of the country to meet the demand of the growing population. Large scale exploitation of ground water through dug wells and tube wells has created severe problems in many parts of the country. In many areas, ground water withdrawals have far exceeded the recharging capacity of the aquifer, resulting in lowering of the water level and drying of wells. In intensively cropped areas ground water levels have fallen dramatically. In order to get adequate water one has to undertake deep drilling. This calls for heavy expenditure, which is generally beyond the means of the average cultivators. This has resulted in chronic shortages of drinking water in many parts of Gujarat and Maharashtra. Over-withdrawal of ground water in many coastal areas has promoted salt water or sea water intrusion, which has made the ground water unfit for drinking and irrigation. The use of ground water needs to be strictly regulated to prevent its pollution and over-exploitation.

Threat To Wild Life

Flora and fauna are priceless gifts of nature. They provide the essential underpinnings for cultural, industrial and economic development of a country. Nature has been very generous to India in providing a rich variety of flora and fauna which constitute its wildlife. The richness of Indian wildlife can easily compare with that of any other country of the world. More than 1200 species of birds and 500 species of mammals exist in the Indian region and include such animals as the elephant, the gigantic himalayan sheep, the Indian bison or gaur, deer, cheeta, the

four-horned antelope, the black-buck, the dancing deer or thamin, the one-horned rhinoceros, the lion and the tiger. It is however pertinent to note that populations of wildlife species are rapidly dwindling and many species, e.g. tiger and lion, once present in large numbers, are endangered today.

Rapid increase in human and bovine populations has promoted large-scale habitat destruction by bringing more land under the plough and implementing developmental projects. This eventually has adverse impact on wildlife. To-day, the future of wild animals is, in general, alarming. Many endangered species are fighting a losing battle for survival. The worst victims, no doubt, are the fur-bearing mammals, birds with ornamental feathers and reptiles (crocodiles, snakes, etc). Elephants are hunted for ivory and the rhinoceros is prized for its horn. About 350 species constitute the mammalian fauna of India, of which 81 are endangered. Examples of wildlife extinction in recent times are that of the Indian cheeta, the one-horned rhino and the Sikkim stag, and among the birds, the mountain quail, and probably among the tined species the Jerdon's courser. Over one hundred species of wild animal need immediate protection as their populations have dwindled to dangerously low levels.

Similarly, many plant species have suffered from the onslaught of human activities. Wild plants and animals are sources of many industrial raw materials in addition to providing a variety of other goods and services. It will be great tragedy, if wildlife is allowed to suffer from thoughtless destruction of their habitat by over-exploitation, poaching or ignorance.

Use of Chemicals and Pesticides

Fertilizers

The rapid pace of population growth demands increase in food production. Since independence, India has trippled its cereal production by adopting modern means of agriculture. Chemicial fertilizers are the most essential input for modern agriculture. Fertilizer consumption has increased considerably. From almost zero level per hectare consumption in 1950-51, the consumption in 1986-87 was estimated to have gone up to 48.44 kg per hectare. India ranks as world's fourth largest producer of nitrogen fertilizer and the fifth largest producer of phosphatic fertilizer. At present the consumption of NPK (Nitrogen, Phosphorus, Potassium) in the country is 10.3 million tonnes. By the year 2000 the demand for fertilizers will go up to 20 million tonnes to help produce the projected food grain requirement of 240 million tonnes in order to feed the growing population.

Such a large input of chemical fertilizers will create diverse problems of environmental pollution which can be grouped into two categories:

1. Pollution caused during fertilizer production; and
2. Pollution resulting from the use of fertilizers.

In the manufacture of fertilizers, large amounts of gaseous and liquid effluents are generated as by-products. The pollution caused by such effluents is relatively localized and can be remedied by reducing the volume of effluents or by treating them before their release into the environment. The Central and State Pollution Control Boards are persuading fertilizer manufacturers to cut down the release of effluents by enforcing Minimum National Effluent Standards (MINEAS) prescribed for the fertilizer industry.

The application of fertilizers in the field creates many complex problems of environmental pollution. A substantial portion of the fertilizers applied to the field is lost through runoff, leaching, gasification or biological transformation. Runoff from agricultural fields laden with plant nutrients and excessive fertilizer water bodies is a condition technically called eutrophication. Over-loading water bodies with plant nutrients over-stimulates and disturbs the ecological balance of the aquatic ecosystems. Leakage of nitrate into the ground water creates the danger of nitrate poisoning. The problems of environmental pollution caused by the application of fertilizers in the field are widespread and difficult to control. Pollution loads build up in the environment in a cumulative manner, bypassing the existing pollution control legislations. The anticipated intensification of agriculture in the future is going to magnify the problems of environmental pollution in the coming decades.

Pesticides

Pesticides are a group of chemicals used for controlling pests, insects, weeds, disease - causing bacteria, fungi and viruses. The organochlorine compounds, which include insecticides like aldrin, dieldrin, DDT (Dichloro Diphenyl Trichloroethene) and its derivatives, are causing great concern to environmentalists. DDT is highly resistant and gets widely dispersed throughout the ecosystem. It is present in rainfall, soil and in wildlife such as the tropical deer and the Arctic penguin. It is soluble in fat and hence, tends to accumulate in very large quantities in the liver of animals occupying the higher levels in the food chain, e.g. man, birds of prey, etc.

The use of pesticides in India has grown rapidly since independence. DDT and BHC (Benzen Hexa Chloride) are the two main pesticides used in large quantities. DDT has been very effective against insect pests that destroy crops and insect

vectors which transmit malaria and plague. Since the cropped area under plant protection has increased from 6.4 million hectares (m ha) in 1960-61 to over 80 million hectares in 1980, the average consumption of pesticides increased from 3.2 g/ha in 1954-55 to 336 g/ha in 1980. The use of these agrochemicals is going to increase in future. The success of pesticides has been a mixed blessing because their use has serious environmental implications. In 1962 Rachel Carson, in her famous book, *Silent Spring*, highlighted the dangers of introducing large quantities of non-specific pesticides.

A comparative evaluation of DDT in human fat tissue from different countries shockingly revealed that residents in Delhi had very high levels of DDT. DDT and BHC have been found to be abundantly present in samples of butter and wheat flour collected from Punjab. Even mother's milk has been found to be contaminated with DDT. Both DDT and BHC have a lot of residue toxicity and can even cause cancer.

Pesticide use therefore should be strictly controlled and regulated. With a view to controlling the sale and use of pesticides, the government of India passed an Insecticide Act in 1968, but it has been poorly implemented.

Unimaginative Mining

Mining is an extractive process. Coal, lignite, iron-ore, limestone and bauxite are mainly obtained from surface mining. The Indian mining industry is expanding at a steady rate of around 5 per cent. The value of mineral production increased from Rs. 85 crore in 1951 to Rs. 9953 crore in the year 1987.

Mining operations induce serious hydrological disturbances, as some of the aquifers may be intercepted by mine openings. The underground hydrological system is greatly disturbed. Dewatering of mine pits causes water pollution of streams and reservoirs. The Damodar river in Bhowrah has turned black in colour due to suspended solids discharged by the coal washeries in Jharia. Water of many streams in the Bihar-Orissa iron-ore belt is redish yellow due to the discharge of iron-ore fine and lateritic slimes. Also water pollution sometimes occurs due to breaches or overflowing of tailing ponds. The influx of labour engaged in mining creates problems of water pollution due to the discharge of raw sewage.

Dust generated by mining and blasting operations, by the movement of heavy earth-moving equipment and by over-burdened dumps, contributes to air pollution. Diesel operated equipments, such as shovel, dumper, tractor, etc. release lots of CO , SO_2 , NO_x and aldehydes into the environment.

Mining and mineral processing have a great impact on the environment. Open-cast mining is highly devastating and leads to large scale environmental

degradation. Limestone mining in the Mussoorie-Dehradun region and bauxite mining by the Bharat Aluminium Company in the Gandhmardan hills in Orissa, have led to widespread public outcry against the environmental degradation. The main environmental problems caused by open-cast or surface mining are: deforestation, wildlife destruction, land damage, hydrological disturbances, water and air pollution, noise and ground vibrations, displacement of population, socio-economic changes and aesthetic blight. Although the actual mining is carried out in a relatively small area, its impact spills over to a much larger area.

In open-cast mining the mineral is obtained by removing the overlying non-ore material. Huge piles of over-burden keep growing around the mine pit creating a 'hill and dale' topography. Over-burden and digout pits are abandoned after the mining excavation is over, since there is no legal obligation for reclaiming the area after mining is over. Mining brings in additional traffic load in the area, leading to the road congestion as well as increase in noise levels. Moreover, eviction of local inhabitants from the ore-bearing area leads to serious socio-economic distortions. The phenomenon of environmental refugees as a result of such environmental degradation poses serious problems. The ancillary and down-stream industries, drawn by the mining activities, cause further deterioration of the environment.

Water Pollution

Water is the life-blood of the environment. Without water no living thing, plant, animal or man can survive. The availability of an adequate and usable supply of water underpins our whole economy. Water is used for transportation and power generation, for waste disposal, recreation, agriculture, and fisheries. It is essential both for the manufacturing and the service sectors.

Requirements of fresh water for different uses during 1974 and the estimated figures for the years 2000 and 2025 are given in Table 6.1.

Table 6.1: Water use of major activities in India, 1974-2025

<i>Use</i>	<i>1974</i>	<i>2000</i>	<i>2025</i>
Irrigation	350	630	770
Domestic & livestock	13	34	50
Industries	5	30	120
Thermal power generation	10	60	160

It may be seen that by the beginning of the twenty first century, there will be a six times increase in the water required for industry, and by the year 2025 it will be 24 times the present demand. A rational pragmatic strategy for the management and recycling of water is needed to cope with such galloping demands. The problem of water pollution consequent upon mismanagement of water has been a matter of great concern. Water pollution is the most important cause of public health problems, both in rural and urban areas. The frequent eruption of epidemics are caused by the pollution of drinking water. Waterborne diseases, such as cholera, typhoid, diarrhoea, dysentery, malaria, and intestinal worms claim a heavy toll every year. Inadequate hygiene, poor sanitation and discharge of industrial effluents have resulted in the pollution of many of our surface water sources.

The main sources of water pollution are summarized as: (1) urban/domestic effluents (sewage, storm, drainage mixed with sewage, human, cattle and kitchen wastes); (2) industrial liquid effluents; (3) surface runoff from cultivated fields where fertilizers, pesticides, insecticides and other agro-chemicals are used; (4) surface runoff from urban and industrial solid-waste dumping areas, and (5) nuclear and thermal plant discharges.

Domestic wastes constitute approximately 90 per cent of total pollution load, while 7 per cent is from large and medium industries and 3 per cent from small scale industries. In Delhi, domestic wastes constitute approximately 98 per cent by volume. In Bombay, the industrial capital of India, it is approximately 84 per cent.

The Sabarmati is the most polluted river of the country with a BOD (Biological Oxygen Demand) level of 155 mg/l (milligram per litre). The Mahi, the Narmada, the Tapi, the Krishna, the Cauvery, the Pennar, the Godavari and the Subarnarekha rivers are also polluted in stretches. All the major rivers immediately downstream of big cities are polluted. The Ganga river is most seriously polluted near Kanpur, Varanasi and Howrah. The BOD levels in Varanasi and Kanpur are at times reported to be higher than 30 mg/l.

The status of sewage control and treatment in Class I cities (with population of 100,000 or more) and in Class II cities (with population of 50,000 - 100,000) is very precarious. India's progress in controlling domestic wastes, as surveyed during 1978-80, is indicated in Table 6.2.

As regards water pollution caused by industries, 17 categories of industries have been identified as contributing to it. Out of the 1,700 large and medium scale industries identified as water polluters, approximately 800 have established pollution abatement devices.

Table 6.2: Status of disposal of domestic waste water

<i>Class of City or Town</i>	<i>Number</i>	<i>Sewered</i>	<i>Unsewered</i>	<i>Waste water volume (millions of litres/day)</i>		
		<i>(per cent)</i>		<i>Generated</i>	<i>Collected</i>	<i>Treated</i>
Class I	142	43	57	7,000	598	378
Class II	198	12	88	1,200	158	58

Ocean Pollution

Ocean and coastal areas have also suffered from the pressure of growing human population. They are being used as convenient dumping sites for all kinds of water, including toxic and hazardous materials, without giving much thought to the consequences. In addition, the use of sea routes for transporting oil cargo causes problems of oil pollution of the marine environment. One of the important oil tanker routes passes through the Arabian Sea and Southern Bay of Bengal and it lies close to our western sea coast. Leakages and oil spills from tankers are the prime causes of oil pollution of the marine environment. Besides, when tankers are involved in accidents, the impact on ocean water is still more serious. Crude oil, being immiscible and lighter than water, quickly spreads and floats over the sea surface. Oil slicks are carried to the shore by sea currents. An oil cover on the sea surface blocks the free exchange of gases between sea water and the atmosphere. Floating oil slicks choke the gills of fish and clog the plumage of marine birds. In short, the communities of marine organisms are completely destroyed. Offshore drilling and oil production is yet another potential threat for large scale oil pollution of the marine environment.

Recent satellite surveys suggest that the oil pollution of the Arabian Sea has increased considerably. Beaches along the west coast of India are plagued with tar-ball deposition which adversely affects their use as recreation spots and discourages tourism. Clean - up operations are very expensive, cumbersome, inefficient and are rarely carried out. Consequently, oil pollution of the marine environment generates several complex problems.

Air Pollution

Air pollution is one of the major problems. It is caused by moving and point sources. Moving sources are represented by automobiles, ships, aircrafts and rockets.

Industries and thermal power plants are examples of point sources of air pollution.

The burning of fossil fuel produces oxides of sulphur, nitrogen, carbon dioxide, carbon monoxide and a complex mixture of organic compounds along with particulate matter. The most important pollutants in the Indian environment are suspended particulate matter (SPM) and SO_2 (Sulphur dioxide). The SPM levels in most of the urban areas are beyond the permissible level. In fact, an unpleasant pall of dust has become almost an integral part of urban areas. Air pollution problems are most visible. They affect living organisms significantly. Apart from creating problems of poor visibility, dust pollution causes respiratory diseases particularly in children and elderly persons.

Sulphur dioxide (SO_2) is the most important among the gaseous pollutants. It is released by thermal power plants and other industries along with a large amount of flyash. The problem of flyash and SPM pollution caused by power plants, cement and other industries, can be controlled by their installing electrostatic precipitators. The gaseous pollutants, however, escape into the atmosphere. Growing consumption of fossil fuels has enormous implications for the air quality. An estimate made some time ago indicates that SO_2 emission from fossil fuels in the country has increased from 1.4 m tonnes in 1964 to 3.2 m tonnes in 1979 (Varshney and Garg, 1978). It is expected to increase further as the tempo of industrial development gains momentum. Sulphur dioxide affects all living organisms, but plants are particularly vulnerable to this gas.

The average content of lead in the environment is increasing. Tetra-ethyl lead is added in petrol as an anti-knock agent. A study carried out in Delhi has revealed that the lead content in the ambient air near the road side varied between 90 to 324 nanograms per cubic meter (ng m^{-3}), while its value never exceeded 62 ng m^{-3} in the background station located away from vehicular traffic.

Acid Rain

Acid rain, which has emerged as the great scourge in the industrial countries, is regarded an imminent threat to India, where the emission of acidic gases is sharply increasing. In the last few decades the rain water has become acidic over large areas in Europe and North America. The term 'Acid Rain' is used to describe all precipitation rain, snow, sleet, dew which are more acidic than normal. Acid deposition is caused when sulphur and nitrogen oxides from coal and oil fired power plants, from industrial processes, such as metal smelting, and from motor vehicle exhausts, combine in the atmosphere with water vapour, sunlight and oxygen to form sulphuric and nitric acids. Environmental acidification, is thus, a man-made

phenomenon. Emission of sulphur dioxide and oxides of nitrogen are prime contributors to atmospheric acidification, as they readily dissolve in the atmospheric moisture forming sulphuric and nitric acids which make the rain acidic.

The ecological impacts of acid precipitation are far-reaching, insidious and often produce irreversible changes. Acid rain has a corroding effect on plant leaves and thus pre-disposes them to pests, pathogens and other environmental stresses. The soil becomes acidic — a condition which releases toxic heavy metal ions in the soil and promotes the loss of calcium and magnesium (which are essential plants nutrients) from the soil. The cumulative effect is the gradual degradation of soil and a decline in forest productivity. In aquatic systems, acidic rain raises the levels of toxic heavy metals (such as aluminium, copper, zinc, etc.) resulting in the death of fish and the reproductive failure. Increased acidity of lakes and streams prevents hatching of fish eggs and kills the young fry. Acidification in industrialized countries is responsible for making thousands of lakes unproductive, turning them into virtual biological deserts.

The vast expansion of thermal power generation and other industrial activities contribute to environmental acidification. The release of sulphur dioxide and oxides of nitrogen are rapidly increasing in the Indian environment and this trend is going to intensify in the future due to growing demands of our galloping population. Systematic and reliable data on the acidity of rain water in India are lacking, but occasionally acid rain has been reported from Bombay, Delhi, Nagpur, Pune and a few other stations.

Green House Effect

Carbon dioxide is a natural constituent of the atmosphere and has a concentration of a little over 0.032 per cent by volume, a ratio of 1 to 450 with oxygen. In spite of its relatively small proportion, carbon dioxide plays a very important and useful role in the biosphere until its ratio is disturbed. It is like glass, transparent to visible light but absorbing the infra-red radiations. It lets the sun's rays through to the earth, but traps the heat that would otherwise be radiated back into space. While the natural levels of carbon dioxide keep the earth's temperature at a comfortable 15°C, any increase in its level makes the earth hotter.

It is in view of this phenomenon that a great concern is growing because of the steadily increasing carbon dioxide concentration in the atmosphere. It is estimated that from 1700 to 1975 the concentration of carbon dioxide in the atmosphere has increased from 270 ppm (parts per million) to 334 ppm. Its over-all concentration has increased by nearly twenty five per cent since the process of industrialisation

started in the world. Most scientists are therefore in agreement that global warming is underway. This phenomenon is known as the 'Green House Effect'. Besides carbon dioxide, other trace gases like methane, nitrous oxide (laughing gas), the chloro-fluoro-carbons (CFCs) and ozone also produce the Green House Effect and have an additive action. What will be the environmental impact of this phenomenon? How will plants, animals or ecosystems as a whole respond to it?

Precise predictions are difficult, but significant studies indicate that due to a global increase in carbon dioxide, the temperature of the lower atmosphere is likely to increase by 1.5°C to 4.5°C by the year 2030. This would lead to a rise in the global sea level because of two major reasons. First, the rise in atmospheric temperature will make the average temperature of the oceans warmer. Because of this heat transfer, the water of the earth will expand. Second, the rising temperature will result in the melting of polar ice caps, which will ultimately result in the rise of the sea level. Empirical studies predict that global warming would lead to a rise in sea level between 1.4 metres to 2.2 metres by the end of this century. This would have obvious implications to millions of people living in coastal areas and delta regions of rivers like the Ganges.

Increasing carbon dioxide will induce sweeping changes in the biosphere. Plants will be affected by the rising levels of 'green house gases' in two ways. First, the high concentration of carbon dioxide will have a fertilising effect and will encourage plant growth. Second, the concomitant increase in the ambient temperature will induce long-term climate change. Climate shift will upset the present day cropping pattern over large geographical areas. Some animals will die out completely while others will migrate northward. Insects will breed faster. Many wetlands will dry out, some food chains will be altered and broken or some will disappear. The over-all impact will be distressing.

Ozone Depletion

Ozone is a deep blue gas made up of chemically bonded oxygen atoms and is a minor constituent of the earth's atmosphere. It is found everywhere between sea level and a height of 60km in varying concentrations. In the air we breathe, ozone is a health hazard, a constituent of air pollution that has a caustic effect on human skin. However, in the stratosphere, ozone forms a delicate veil, filtering out UV radiation from sun's rays entering the earth's atmosphere. In fact the presence of an ozone layer in the stratosphere is vital for life on earth because it is the only natural shield against UV radiation, which is a potent mutagenic agent.

It has recently, been discovered that the protective ozone layer is getting progressively eroded due to the impact of increasing human interference with the environment. A significant reduction in the ozone layer over Antarctica is already a matter of concern. The major cause for the depletion of the ozone layer is the worldwide emission of man-made compounds called chloro-fluoro-carbons (CFCs). Chloro-fluoro-carbons are used in refrigerators, air conditioners, aerosols, sprays, for the cleaning of computer chips, and in the making of rubber foam and polystyrene containers required for food packaging. CFCs are by and large chemically inert, having no direct effect on humans or other living organisms. After their release they ultimately find their way to the stratosphere where they chemically react with ozone molecules, breaking them down. If the release of CFCs continues at the current rate, the ozone layer will be further depleted and living organisms, including human beings, will be exposed to higher levels of UV radiation. Scientists believe that increased doses of UV radiation will cause eye damage, skin cancer, and will accelerate the aging process both in humans and domestic stock at all latitudes. The seriousness of ozone depletion is similar to the hazards of nuclear disaster. It is urgently necessary to prevent further damage to the ozone layer.

EFFORTS TO IMPROVE QUALITY OF ENVIRONMENT

In India there has been a growing realisation of the impact of the increasing population and accelerated development strategies on the quality of the environment. The increasing human demands have been exerting great pressure on the natural resource base, agricultural land, energy sources, vital watersheds, forests, etc., resulting in environmental degradation. Recurring natural calamities, such as floods and droughts, have attracted the attention of one and all. The concern was well reflected in the Parliament when a specific provision on protection and improvement of the environment and safeguarding of forests and wildlife was added to the Chapter on Directive Principles of State Policy by the Constitution (Forty-second Amendment) Act, 1976.

Article 48 A of this Chapter states: 'The State shall endeavour to protect and improve the environment and to safeguard the forests and wildlife of the country'.

This constitutional amendment further evidenced the concern of the Members of Parliament for environmental improvement by incorporating Part IV A on Fundamental Duties which provides for a duty of citizens to the environment. In its Article 51 A the Constitution states: 'It shall be the duty of every citizen of India ... (g) to protect and improve the natural environment including forests, lakes, rivers and wildlife, and to have compassion for living creatures'.

However, the official concern for the environment was expressed for the first time in the Fourth Five Year Plan Document, which emphasised the need to introduce environmental dimension into the development planning process. In 1972 a Committee on Environmental Planning and Coordination (NCEPC) was set up to advise the government on all environmental matters. In January 1980 another Committee was set up to suggest legislative measures and an administrative machinery for ensuring environmental protection. On the recommendations of this Committee, the Department of Environment was set up by the Government. Subsequently, a separate Ministry of Environment and Forests was established in 1985 to deal with various environmental matters. The government has initiated a number of measures to protect and upgrade the environment.

Thirty major enactments related to the protection of the environment are now being administered by the central and state governments. The Water (Prevention and Control of Pollution) Act, 1974 and the Air (Prevention and Control of Pollution) Act 1981, the Factories Act, and the Insecticide Act are some of the prominent ones among these enactments. The Bhopal gas tragedy in 1984 came as a rude shock and it exposed the dangers of hazardous chemicals. A Union Carbide pesticide plant accidentally released a cloud of deadly methyl isocyanate over the town. This accident killed about 2500 and more than 200,000 people fled for their lives. Nearly 100,000 people are still suffering from various kinds of side effects, such as blurred vision, lung diseases, intestinal bleeding and neurological disorders. This led the Government to enact the Environment Protection Act (1986) to deal with the environmental matters in a comprehensive manner and to plug the loopholes in the existing legislations.

The government has made it mandatory that environmental issues and unintended ecological side effects of the proposed development projects are identified in advance and necessary corrective measures are incorporated to reduce the undesirable environmental impact. Project approval by the Ministry of Environment and Forests often requires implementation of suggested safeguards and mitigative measures. The Central and State Pollution Control Boards have been constituted. The Central Board has prescribed minimum national standards for liquid and gaseous effluents in respect of 12 major polluting industries. An ongoing programme of monitoring and assessment of air and water quality is being carried out to keep a close watch on the emerging trends. There are a number of critical environmental challenges that are being met by undertaking suitable measures.

Countering Deforestation

Soon after independence in 1947, the Government of India took note of the extensive destruction of the forest wealth of the country. In order to reverse this trend and to arouse public consciousness about the importance of forest in the welfare of the nation, an annual tree planting festival was started in 1950. Since then each year, tree planting campaigns have been undertaken while celebrating 'Van Mahotsava'. In the early years there was a great enthusiasm and the response of the people was quite encouraging. Unfortunately, over the years it has lost its vigour reducing it to a mere ritual without much impact. The concept of 'Van Mahotsava' is highly relevant but unfortunately it has entered into deep dormancy.

Deforestation has been occurring for many years and about half of the area under forests in the country is degraded. Ecological restoration of damaged areas is needed for meeting the socio-economic needs of the people. The National Agriculture Commission recommended that 'Social Forestry' be undertaken to meet the fuel-wood, fodder and small timber needs of rural communities. The main objectives of social forestry are to relieve the pressure on existing forests, to promote the productive use of public and common lands in a decentralized manner, to promote soil and water conservation and to create employment opportunities in rural areas. It envisages creation of local village level nurseries and involvement of the local population including women and children to raise trees of their choice to meet their needs. This includes the planting of trees on denuded and even on agricultural lands inter-mixed with crop plants or along farm boundaries or on vacant lands. Depending on local conditions, it can take any one of the following emphases: Agri-silvicultural, Agri-pastoral or Agri-silvipastoral.

The government has been laying considerable emphasis on social forestry programmes since 1986 and fund allocation for this purpose has been steadily growing. Tree seedlings are being distributed free to the poor people in rural areas. 'Tree Patta' and other similar arrangements have been introduced in many states to give usufruct rights over trees planted and protected on public lands by the rural poor. The usufruct rights provide the individuals the right to use the trees and get profit out of them, but they cannot be regarded as their property. Until recently, tree planting and afforestation programmes have remained mostly confined to quick-growing trees like Eucalyptus or other commercial species. This has increased the raw material supply instead of mitigating shortages of fuel-wood and fodder.

To bring about qualitative changes in the programme, in June, 1988, the National Wastelands Development Board (NWDB) was set up with the principal aim of regenerating wasteland through massive afforestation and tree planting. Wasteland

maps have been prepared for 146 selected districts in 19 states, showing village-wise distribution of 13 categories of wastelands. Village-specific action plans identifying land treatments, if any, need to be prepared. The future programme would focus on drylands for the production of fuel-wood, fodder and small timber on public lands and multiple purpose trees under farm forestry.

The Government of India announced a comprehensive National Forest Policy in December 1988. The principal aim of the new policy is to ensure environmental stability and equilibrium, which are vital for sustenance of all life forms, human, animal and plant. The derivation of direct economic benefit must be subordinated to this principal aim. A great deal of organisational effort will be needed for the successful implementation of this policy.

People's participation

Enlightened public opinion and active involvement of people is necessary for protecting and improving the local environment. A local leader, Chandiprashad Bhatt started a practical and non-violent method—the 'Chipko Movement'—to save the forest of Uttarakhand from the axes of contractors. On 27 March, 1973 the residents of Mandal village of Chamoli district did not allow a sports goods manufacturing firm of Allahabad to fell the ash trees auctioned to them by the U.P. government. The sports company moved towards Mandakini Valley of the Kedarnath region. But there too they met with similar resistance. Hill women and children showed remarkable courage and joined the 'Chipko Movement' and successfully saved the village trees from felling.

The 'Chipko Movement' highlighted the value of conservation over the extraction of temporary economic benefits from trees. A new slogan was given, namely 'what do the forests bear? soil, water and pure air. Soil, water and pure air are the basis of life'. A massive planting of trees was started to provide the five 'I's'—food, fodder, fuel, fertilizer and fiber. Within a few years, the 'Chipko Movement' developed into a powerful mass-based ecological movement in the country.

Protection of wild plants and animals

Various animal species and plants are great assets for the future well-being of society. Wild plants and animals have provided breeding materials for improving the commercially useful species. A few instances will display their invaluable contribution to human welfare and prosperity. A wild melon from India provided the genes for resistance to mildew of a melon crop as far away as in California in the United States. A wild rice collected in 1963 in Uttar Pradesh gave the genes which

saved 30 million hectares of paddy from grassy sweet virus. The 'Kaus' grass (*Saccharum spontaneum*) from Indonesia provided the genes for resistance to redrot disease of sugarcane. Among animals, the showl cows of Punjab and Haryana and the goat of Etah district of Uttar Pradesh have been utilised for improving the breeds of these animals in many countries.

Penicillium, a microscopic soil fungus, which is a source of the popular antibiotic Penicillin and *Cinchona*, from which quinine is obtained, were unnoticed species until their useful properties were discovered. What a great loss it would have been if these two species had become extinct before the discovery of their medicinal value. Our knowledge about the majority of wild plants and animals is very limited, and hence losing them without knowing their virtue will be a great tragedy.

But deforestation, poaching, monoculture, pollution and habitat destruction have already caused extinction of many species of plants and animals. The widespread use of selected high-yielding varieties of crop plants as well as mechanisation of agriculture has dangerously eroded the genetic diversity of agriculturally viable species. According to an estimate, the number of endangered species of flowering plants in the country has sharply risen from hundreds to thousands over the past few years. It is now feared that 10 to 20 per cent i.e. over 2500 species of the total vascular plants, may now fall in one or the other categories of threatened species. All species, whether they are economically useful or not and whether their economic uses are known or not, are of crucial importance in the ecosystem.

Long term measures directed towards conservation are necessary for protecting the plants and animals. The conservation of threatened and endangered wildlife species is best achieved when their natural habitats are protected. In our country a number of natural areas have been set aside with a view to conserve various endangered wildlife species. There are now sixty-seven National Parks and 394 Sanctuaries distributed all over the country, representing 4 per cent of the total geographical area. They cover a wide range of ecosystems ranging from forests, grasslands, deserts, river basins, lakes, wetlands, mangroves and marine areas. Special efforts have been made to conserve the magnificent tiger, which is our national animal, by establishing 17 tiger reserves, covering an area of 26,643 sq. km. in 13 states.

It is now increasingly recognised that conservation of wild areas along with the inherent diversity of their plants, animals, insects and micro-organisms is vital for sustainable development. Long-term conservation of the representative ecosystems of the country has been initiated by creating four Biosphere Reserves namely, the

Nilgiris, Nanda Devi, Nokrok and Great Nicobar. Another nine potential biosphere sites have been identified.

Recycling of Resources

Almost all facets of human activity produce large quantities of undesirable by-products which are called wastes. For every ton of grain, fruit or vegetable produced, between two and three tonnes of solid waste are generated.

Based on a 'global average', it has been calculated that a city of one million inhabitants generates 500,000 metric tonnes of waste water, 2,000 metric tonnes of solid wastes and 950 metric tonnes of air pollutants every day. The quantity and variety of wastes are growing with urban and industrial expansion. Waste disposal is becoming a major concern demanding a substantial share from the budgets of civic bodies. Waste disposal, being non-remunerative, is usually treated with neglect, resulting in the piling up of waste heaps in towns and cities resulting in frequent outbreaks of epidemics.

This need not be so, if waste recycling is practiced and by-product utilization is taken up seriously. Nature does it for itself all the time. In sharp contrast to human societies, recycling is a norm in nature, hence the problem of waste is non-existent. For example, green plants utilize carbon dioxide produced by other living organisms or released from the decomposition of dead plants and animals.

Wastes are of two types, namely organic and inorganic. They can be potential sources of materials or energy or both, provided they are imaginatively recycled. Waste recycling and utilization can take any one or more of the following forms, namely retrieval of useful material, resource separation, energy recovery and innovative utilization.

Waste picking is an established practice in urban and industrial areas. Useful materials such as glass bottles, containers and metal scrap are recovered and sold. A 10 MW capacity thermal power plant is already operating using rice husk in Punjab. Similarly bagasse is another potential source of energy. A 3.75 MW plant has been installed in Delhi to generate power from the incineration of the city waste.

It has been convincingly demonstrated that cattle dung, human excreta, agricultural and domestic wastes are suitable feed-stock for biogas generation. In the Okhla area of New Delhi the city sewage is utilized for generating biogas which is supplied to the nearby colonies as domestic fuel.

Innovative waste utilization

Large quantities of flyash produced in coal-fired thermal power plants can be used for a variety of purposes such as for the production of cement and bricks, for applying as soleing material for roads and air strips and for using as building material. Waste recycling and reuse are essential for resource conservation, environmental improvement and sustainable development. The following examples indicate the patterns of the implications involved in the recycling process.

Composting: Considerable amount of agricultural and animal wastes are traditionally composted and used as farm yard manure in villages. But with the advent of inorganic fertilizers, this practice is fading away over the years.

Land fills: In almost all towns and cities, the most common method of disposing solid waste is by using it for land filling and land reclamation. In big cities like Calcutta, Bombay, Delhi and Madras several residential flats have been constructed by reclaiming land through this process. This is seldom carried out scientifically and hence the land fill sites become potentially dangerous to public health.

Cleaning Up the Ganges

The Ganges, one of the most celebrated and revered rivers in the world, is also one of the most polluted. Almost one-third of the country's population lives in the Ganga basin. Out of 100 towns and cities situated along its banks, 20 per cent represent major urban conglomerations. The rapid growth of these centres has led to over-exploitation of the rivers, leading to rapid degradation of the river water quality.

Some 600 km of its total length (2,525 km) are dangerously polluted with human, animal, agricultural and industrial wastes. The majority of villages, towns and cities situated on the banks of the Ganga have no sewage treatment plants and, even if they exist, they are far too small, badly maintained and poorly operated. Frequently water flows through open drains into the Ganga. Experts say that if sewage discharge alone could be stopped, pollution levels of the river would drop by 75 per cent. Contamination of water by sewage is the principal cause of water-borne diseases, including cholera, typhoid and para-typhoid fever, dysentery and infectious hepatitis. In addition to sewage, dead bodies, half cremated corpses, dead animals and synthetic detergents are additional factors responsible for destroying the health of the river Ganga. Detergents release large amounts of phosphates, which over-fertilize the river water, leading to many undesirable effects on the water quality.

The practice of intensive agriculture in the Ganga basin has greatly promoted the consumption of chemical fertilizers. The Ganga is constantly fed by surface run-off from cultivated lands which have been treated with excessive amounts of fertilizer and manure. A two-year study conducted by the Central Pollution Control Board indicates that 1.15 m tonnes of pesticides were applied in the Ganga Basin - an amount equal to 34 per cent of India's annual consumption. A large proportion of this ultimately finds its way to the Ganga through run-off waters.

Recognizing the need to protect human health and the ecology of the river, the Government of India has launched a major clean-up programme, called the Ganga Action Plan. Over the next five years, the government has committed Rs. 250 crores for the rehabilitation of the river.

During the first phase of the Action Plan, a number of measures have been undertaken. A number of projects are being implemented to renovate the existing sewage systems in all towns and cities along the Ganga to upgrade all existing sewage treatment and pumping plants, to instal new sewage treatment plants wherever necessary and to extend sewage lines into areas not currently covered by the treatment network. These projects also relate to the construction of large community cattle sheds in urban areas to collect animal wastes for biogas and fertilizer and regulation of the use and application of pesticides and chemical fertilizers in agriculture in the watershed of the Ganga to minimise surface run-off.

One of the important features of the Ganga Action Plan, therefore, is to recover and recycle the organic wastes for useful purposes. Sewage is a very rich source of energy (as a feed stock for producing methane or biogas) and of organic manure. A proper sewage treatment plant can yield both energy as biogas and slurry (a byproduct of the anerobic digestion) which can be used as an organic manure.

NATURAL RESOURCES : RATIONAL UTILISATION

The interrelationships between population, resources and environment are very complex. It demands a consummate understanding for appreciating the linkages that are crucial for sustainable development. However, it is universally accepted that human survival depends on resources like air, soil, water, forest, wildlife and minerals, which nature has bestowed on us. It is also being increasingly realised that rapid population growth has resulted in great pressure on natural resources.

Let us examine the potentials and limitations of our natural resources, which can be grouped into *living* and *non-living* resources. They can also be categorised on the basis of their inherent characteristics into two categories, namely *renewable* and

non-renewable resources. Some resources are inexhaustable and keep on renewing themselves if managed properly. These are known as renewable resources. But resources like coal, petroleum, etc. are non-renewable, as the stock of these resources is fixed and with constant use their quantities decrease. The regeneration capacity of even renewable resources is seriously impaired, or may even be lost, if these are not properly managed. Extinction of plant and animal species, desertification, soil erosion and salinisation are examples of renewable resources becoming non-renewable through overuse and excessive exploitation.

The natural reserves of metals and minerals are fixed and finite. Strictly speaking they are non-destructable and can be recycled repeatedly. But in practice they get dissipated and dispersed through human use. Sometimes metals are used only once and their recycling is not practised, because the collection and processing of the used metal is cumbersome or expensive. It is therefore very much desirable that natural resources are conserved and managed wisely to avoid their wastage or under utilization. The conservation and efficient utilization of living and non-living resources is vital for meeting the demands of the growing population. The status of some important natural resources is discussed in the following section.

Mineral Resources

Mineral resources greatly contribute to the generation of wealth. Our country is richly endowed with minerals. India is self-sufficient in 35 minerals which are used as raw materials by various industries. Table 6.3 gives an idea of the available quantities of some important minerals in the country. The main mineral producing states are Bihar, Madhya Pradesh, West Bengal, Gujarat, Rajasthan and Andhra Pradesh.

The mining and mineral industry has steadily grown during the past years. The mineral production in 1976 was worth Rs. 1,365 crore and it rose to Rs. 9,641 crore in 1986. The share of fuel minerals, non-metallic minerals and metallic minerals was worth Rs. 8,226, Rs. 770 and Rs. 644 crore respectively. The major mining operations in India are open-cast, which severely affect the land-use pattern in the area. Land subsidence in underground mining areas affects the general landscape very adversely.

Coal

The total coal resources in India according to the estimate made by the Geological Survey of India (1984) is 117 billion tonnes. Out of this, 86,427 million tonnes can be categorised under reserves. These consist of coal seams situated upto 600 metres of

Table 6.3: Estimated reserves of some important mineral resources in India

<i>Mineral</i>	<i>Estimated Reserves in Crore tonnes</i>
Bauxite	265.37
Chromite	13.53
Copper Ore	57.60
Diamond	10.00 ¹
Dolomite	395.00
Gold	148.5 ¹
Fire Clay	49.28
Gypsum	124.86
Graphite	46.4 ¹
Iron Ore	19,757
Lead Zin	35.85
Limestone	7.320
Manganese	13.50
Nickel Ore	23.13
Tungstan	71.00 ¹
Refractory Minerals: (Magnesite, Kyanite, Sillimanite)	23.91

Estimated Reserves in lakh tonnes

depth and more than 1.2 meters in thickness. About 5,049 million tonnes of coal deposits can be categorised under conditional resources which cannot be mined under present-day technological options. The balance resources are distributed between speculative and hypothetical resources depending upon the degree of certainty in the exploration of deposits.

The proven coal reserves in the country are of the order of 156 billion tonnes. The actual coal production in the country has increased from 55.67 million tonnes in 1960-61 to 180 million tonnes in 1988-89. By 2004-05 the coal production is expected to increase up to 450 million tonnes per annum. Almost two-thirds of this will be from open - cast mines and one-third will be from underground mines.

Petroleum

The balance recoverable reserves of oil and natural gas in the country are at present estimated at 58.1 crore tonnes and 541 billion cubic metres respectively. The annual production of crude oil was around 320 lakh tonnes in 1987 and that of natural gas was about 981.2 crore cubic meters in 1986-87. The balance recoverable reserves of natural gas increased from 35,200 crore cubic meters as on January, 1980 to 54,100 crore cubic metres in January 1987. The present requirement of petroleum products is in excess of domestic availability and the shortfall of about 16 to 17 million tonnes is being met through imports. The demand for petroleum products is expected to rise to about 111 million tonnes by the year 2004-05, whereas the domestic production is likely to attain a level of only about 58 million tonnes. We will, therefore, have to continue to depend on imports to meet a substantial part of our demand for petroleum products in the coming years. The position in respect of the availability of natural gas is, however, expected to improve considerably over the coming years and the reserves of natural gas in the country are expected to last much longer than those of crude oil. In 1987 there were 12 refineries in the country having a total capacity of 467.00 lakh tonnes.

Energy

Power is the most basic requirement for industrial and economic development. The total energy consumption of 186.3 million tonnes of coal replacement in 1953-54 has grown to about 750 million tonnes of coal requirement in 1988 and is expected to rise to 1424 million tonnes by the year 2000.

The power generation scenario shows that thermal power is most important modality followed by hydro-electric power, while nuclear power contributes only about 3 per cent to the total power output. In the foreseeable future, the contribution of thermal power is going to grow further while the relative position of hydro-electric and nuclear power generation will remain the same. The environmental impacts of these different types of power generation are discussed below.

Environmental impact of thermal power generation : Thermal power generation has a wide variety of direct and indirect effects on the environment. The direct effects are due to the combustion of coal which gives rise to a number of air-borne effluents, the most important of which are sulphur oxide, nitrogen oxide, carbon monoxide, carbon dioxide, particulates, organic compounds, trace metals and radionuclides.

Substantial amounts of nitrogen oxides, (primarily NO with smaller quantities of NO₂) are generally present in the effluent gases. The source of nitrogen oxides is not the fuel *per se* but the nitrogen in the air combines with the oxygen in the air during the combustion process to produce NO. Later, most of the NO oxidizes to NO₂, which in turn, can combine with water to form nitric acid aerosol.

Environmental aspects of hydro-electric generation: Hydro-electric generation has a number of environmental impacts. No dam can be built and no impoundment can be created without affecting the environment. A dam becomes a dominant factor in the hydrological regime, and sets in motion a series of impacts on physical, biological and socio-cultural systems. The dam and the lake behind it cause many effects on the environment regardless of the dam's geographical location. The environmental side-effects of dam construction are generally divided into two categories: (a) the local effects and the reactions within the area of the man-made lake, and (b) the downstream effect resulting from a change in the hydraulic regime. Both types of side-effects of hydro-electric generation have a complex impact on the physical, biological and socio-economic environment:

The flooding of the region could have immediate and significant impact on the means of communication, historic sites, communities which are inundated, and the local flora and fauna. In this connection the Silent Valley represents an excellent example. A hydro-electric dam was proposed to be constructed in the Palghat district of Kerala. The project involved the construction of an RCC arch dam of a height of about 130 meters across the Kunthipuzha river. The river flows through a gorge formed by two hillocks rising approximately 160 to 250 meters above the bed level. The dam was supposed to submerge over 670 hectares of virgin tropical rain forest, which to the project proponents was not very important. Ecologically, the area represents the highest expression of mother nature and there are hardly any comparable examples in the tropical world. The dam itself would present an obstacle, not only to the free running of water, but also to fish migration and navigation. In order to save the precious gene-pool, representing a million years of evolutionary work of nature, and in view of the overwhelming ecological considerations, the silent valley project was dropped altogether.

Environmental impact of nuclear power generation: Environmental hazards of nuclear power have been the subject of heated debate the world over. The environmental consequences of nuclear power generation are most complex and potentially dangerous.

The health hazards of radiation are the consequences of alpha and beta particles and gamma rays emitted by radioactive materials. These particles and rays can

permanently change the hereditary material of cells in living organisms, thereby inducing cancer. Firm evidence suggests that people who have been exposed to low level radiation over extended periods of time show an increased incidence of leukemia (cancer of the white blood cells), skin, thyroid and lung cancer. For example, studies of children who have received X-ray treatments in the neck region have shown an increased incidence of thyroid cancer. Generally, a five-to-twenty-year latency period elapses following exposure before these diseases are diagnosed.

Low level exposure also accelerates the ageing process, thus shortening life span, and can cause chromosomic damage (mutations). The human foetus is particularly susceptible to radiation damage.

Exposure to radiation has an additive, or cumulative effect. The radiation from medical and dental X-ray are added to the natural background radiation, thus, resulting in greater total exposure.

The half lives of radioactive wastes produced by fission reactors vary widely from 0.96 second for xenon - 143, to as long as 24,400 years for plutonium - 239. Usually at least 10 half-life periods must elapse before a source decays to a point at which it no longer constitutes a serious radiation threat. The nuclear waste must be kept in isolation to prevent human exposure. The first several hundred years are most critical. Future generations will have to watch over these wastes for centuries.

The accident of the Three Mile Island nuclear power plant at Middle Town, Pennsylvania, U.S.A. on March 28, 1979 and the Chernobyl accident in the Ukraine in the USSR on April 26, 1986 have provided sharp focus on the hazards of nuclear power.

The important environmental hazards of nuclear power are summarised below:

1. Mining of uranium-radon gas in uranium mines is a major health hazard;
2. Enrichment of fissionable uranium from 0.7 per cent to about 3 per cent;
3. Pelletization of uranium;
4. Transportation of radioactive material;
5. Leakage of radioactive material from fuel element to receiving body through cool - out;
6. Disposal of nuclear waste material—currently about 2700 tonnes of spent nuclear fuel are stored at sixty five nuclear power plants throughout the country;
7. Human error and/or mechanical failure internal to installation;
8. Human error and/or mechanical failure external to installation (plane crash);

9. Natural catastrophe (earthquake, tornado, etc.), and
10. Malicious human activity (war, sabotage)

These and other considerations suggest that the chances of a major nuclear accident may not be vanishingly small and the environmental consequences are truly serious.

Non-conventional sources of energy

The energy that conventional sources can provide is far below our present requirements. In addition, the conventional sources of energy like firewood and fossil fuel are fast shrinking. During many years in the past we have suffered from shortages of energy mainly because the energy demand jumps ahead of its supply. Therefore, to meet the growing energy demand of the expanding population, new and renewable energy sources need to be developed. In 1982, a separate Department of Non-Conventional Energy Sources was created by the Government of India to promote the harnessing of solar, wind, biomass, geothermal and oceanic energy sources.

Solar energy

Solar energy, unlike other conventional energy sources, is received abundantly all over the country and provides a source of inexhaustible energy which is non-polluting. India is indeed fortunate to receive an abundance of sun-shine with about 164802100 Kwh/m² year with 250 to 300 days of useful sun-shine in a year. There are a number of possible ways to use in abundance the renewable supply of solar energy. The important among them are various types of heating devices, such as, solar cookers, solar driers and solar heaters, which use the heating property of solar energy. Solar energy can also be converted into electricity by photovoltaic systems. This is accomplished by a special silicon cell which produces electricity when exposed to sun-light. The output from one such cell is small, but a panel of silicon cells connected together produces sufficient power to run water pumps, traffic lights, radio, TV or other appliances.

Wind

Wind is a renewable source of energy and one of the earliest sources of power exploited by mankind to augment his muscle power. The windmill is an invention that dates from the earliest times of recorded history. Egyptians used windmills as

early as 3600 B.C. to lift water. The use of wind energy for driving ships, lifting water, grain grinding, sugarcane crushing, turning of the machines of factories, and for doing many other tasks developed progressively over the centuries. In the nineteenth century wind was used to generate electricity.

Although wind is ubiquitous, it varies widely from one station to another in its intensity and magnitude. It also varies diurnally and seasonally. Therefore, its potential differs drastically from one location to another. Windmills can be installed in those parts of the country where an average wind speed of 8-10 kmph prevails. Coastal areas, mountain tops, grasslands, and islands are the more favourable sites for harnessing wind power. Since wind does not blow all the time, the power output of wind turbines is highly variable and sometimes unpredictable. In India, a number of water pumping windmills have been indigenously developed. Over 1,750 pumping windmills had been installed under a demonstration project by March 1987. Five wind farms, four of 550 K and one of 1.1 MW, installed in the coastal areas, have contributed over 4.0 million units of electricity to the national grid.

The relative contribution of wind power in comparison with other energy sources is going to be small. However, this source could make vital contributions in remote areas with favourable wind resources. The Department of Non-Conventional Energy Sources has taken the initiative for wind monitoring and preparation of wind maps of different parts of the country.

Biomass

Mankind from the time imemorial has been using biomass to meet the energy needs. Biomass includes, strictly speaking, all living material, whether plant or animal. Interest has focussed recently on new and more efficient sources of biomass creation and improved methods of processing to retain as much energy as possible and produce usable fuel.

Biogas

Cattle dung, human excreta and other organic wastes which have biological origin are unusable biomass and pose a grave danger to public health, if not disposed off safely. The biogas technology which has developed during the past few decades has opened up the possibility of disposing these obnoxious wastes by converting them into useful products, mainly biogas (a clean fuel) and organic manure.

A biogas plant operates on the simple principle that when cattle dung or any organic residue is fermented under anaerobic conditions or in the absence of free

oxygen, a combustible gas is generated. Agricultural, domestic, human and animal wastes, water hyacinth or any other organic material can be used as feed-stock for biogas production. Distillery wastes can be suitably used for biogas generation. Obnoxious aquatic weeds, like water hyacinth, can also be used as feed-stock for biogas generation.

The gas produced by the bacterial feeding on the organic material consists of two parts of methane and one part of carbon dioxide. It is a clean pollution-free fuel. It is tapped from the gas collector and can be used for cooking, lighting, pumping water, electricity generation or as fuel for any other purpose. The gas production is maintained by periodically introducing fresh dung into the digester. The spent slurry over-flown from the digester is relatively free from pathogens and is extremely suitable as organic manure or soil conditioner. In rural areas, biogas offers an excellent solution to the problems of energy and environmental degradation. Organic wastes which are potential sources of environmental degradation are converted into useful products, namely clean fuel and organic manure, much needed by rural communities.

Biogas offers many indirect advantages such as conservation of forests which are being increasingly exploited for firewood by the rural communities. It can also relieve women and children from the drudgery of collecting and transporting head loads of firewood over long distances. Village sanitation can also be improved if latrines are attached to biogas plants.

China and India are world leaders in biogas technology. The central government encourages installation of biogas plants by providing cash subsidies. By March 1987 over 8.4 lakh family type biogas plants were already installed in our country.

Geothermal Energy

Geothermal energy, the natural heat contained within the earth is generally too deeply buried to be utilised. However, in some areas of the world that have experienced recent volcanic activity, geothermal resources may exist that can be exploited economically. These are usually found in regions of hot springs or areas where the deep hot rock is known to be fractured or to have spaces that permit water or steam to be circulated to carry heat to the surface.

At such places it provides a source for electricity generation, space heating, drying and refrigeration. It is competitive with other technologies.

In our country the potential for geothermal energy has been identified as occurring in 4 regions: (1) the North-Western Himalayas covering Ladakh, Himachal Pradesh, Punjab and Uttar Pradesh, (2) the Narmada-Sone Valley, (3) the

Damodar Valley, and (4) the West Coast. Forty six hydrothermal areas have been identified where the temperature of the spring water exceeds 150°C . A 7.5 tonne capacity cold storage pilot plant based on geothermal energy has been installed at Manikaran in Himachal Pradesh as a joint venture of the Indian Institute of Technology, Delhi and the Geological Survey of India, Lucknow. Plans are afoot to use geothermal energy at Puga Valley, Ladakh for poultry farming and mushroom cultivation.

Ocean Energy

The form of energy available from the oceans include Ocean Thermal Energy Conversion (OTEC), wave energy and tidal energy. The surface layers of the oceans are continually heated by the sun especially in the tropical belt. Enormous quantities of energy are stored in the surface layers which have higher temperatures ranging between 24°C to 30°C . However, at lower depth, 1,000 M or below, the water temperature ranges between 4°C to 10°C . This temperature difference is exploited to generate electricity by a process called Ocean Thermal Energy Conversion (OTEC). The technical feasibility of OTEC is well established, but the costs are high and further development work needs to be done before it is harnessed. The potential can be successfully exploited for generating electricity. The surging and receding tides produce powerful water currents in coastal channels and streams. The energy of such tidal currents can be used to run electric turbines for electricity generation. The promising areas of the country are the Gulf of Cambay, the Gulf of Kutch and the Sunderbans.

Ocean waves contain considerable energy. The ocean surface is in a state of dynamic interaction with the wind which imparts energy to waves. The wave motion is both horizontal and vertical. The vertical movement of the wave can be harnessed by movement of a float against an anchor.

REFERENCES

- Agrawal, Anil, 1985, *The State of India's Environment 1984-85*, The Second Citizens' Report, Centre for Science and Environment, New Delhi
- CBPCWP, 1984, *Basin, Sub-basin inventory of water pollution The Ganga Basin Part I and Part II*, Control Board for the Prevention and Control of Water Pollution, New Delhi
- DOEN, 1985, *An Action Plan for Prevention of Pollution of the Ganga*, Department of Environment, GOI, New Delhi.
- Publication Division, *India Manual, 1987*, Ministry of Information & Broadcasting, GOI, New Delhi
- IUCN, 1980, "World Conservation Strategy," IUCN, Switzerland
- Kanwar, J.S., Soil and Water-Looking Ahead, The Presidential address at the 37th annual general meeting of the Indian Society of Soil Science, *Indian Journal of the Indian Society of Soil Science*, 1972, pp 203199-206.
- Kanwar, J.S., *Save the Soil Save the Nation*, KRISAT, Hyderabad, A.P., India, 1980
- Khushoo, T.N., 1986, "Environmental Priorities in India and Sustainable Development" Seventy Third Session, Jan., 1986, Indian Science Congress Association, Calcutta
- Ministry of Environment and Forests, *Annual Report 1988-89*, Min. of Environment and Forests, Government of India, New Delhi.
- Government of India, *National Forest Policy, 1988*, No. 3-1-86 F.P., GOI, Ministry of Environment and Forest, New Delhi.
- Sadik, Nafis, *Safeguarding the Future*, New York, UNEPA, 1989
- Siva, Vandana and Jayanta Bandhyopadhyaya, 1986, *Chipko*, INTACH, New Delhi
- Varshney, C.K., 1982, Biosphere Reserves, *India International Quarterly*, 9, 282-287
- Vohra, B.B., 1980, A Policy for Land and Water, Sardar Patel Memorial Lecture, Department of Environment, Government of India.
- DST, 1980, "Report of the Committee for Recommending Legislative Measures and Administrative Machinery for Ensuring Environmental Protection," DST, New Delhi
- World Commission on Environment and Development, 1988, *Our Common Future*, Oxford University Press, Oxford, 1987.

SECTION - V
HEALTH AND NUTRITION

Population and Health

S.D. GUPTA AND A. BHARGAVA

HEALTH

The concept of Health has defied definition for decades. According to a working definition, 'Health is physical, social and mental well-being with an added spiritual element'. The most acceptable definition of health has been provided by the World Health Organisation (WHO) and it defines health as 'a state of complete physical, mental and social well-being and not merely an absence of disease or infirmity'. This definition underlines three major areas worth examining further i.e. physical, mental and social. It also points to an important aspect that simply freedom from disease does not constitute health.

Physical Health

Physical health is a reflection of the optimal functions and appearance of the individual such as:

1. sound sleep;
2. regular activity of bowels and bladder;
3. smooth and co-ordinated movements;
4. intact senses and active reflexes; and
5. proper growth and development.

Mental Health

With the reiteration of the ancient concept of 'a sound mind in a sound body', it is now re-established that physical and mental health are related. Though it is rather difficult to define mental health, freedom from internal conflict, adjustment to adversities and self-control, are the signs of sound mental health. However, on account of its multi-dimensional nature, it is difficult to identify precise measures of mental health.

Social Health

Social health can be measured on the basis of crime rate, illiteracy level, divorce rate and suicide rate.

Determinants of Health

Health has been defined as a relative concept, where the spectrum—ranging from positive health to death — is so wide and fluctuating that it is difficult to ever maintain a status quo. The factors which determine the swing principally fall into five areas:

1. Human biology including genetic constitution;
2. Environment (internal as well as external);
3. Ways of living (including hygiene, practices and behaviour);
4. Socio-economic status (a sum of education, occupation and income); and
5. Comprehensive health services (their availability, accessibility and affordability, which decide the utilization by the society).

Indicators of Health

To be able to determine how healthy an individual or a community is, one first has to decide how to:

1. measure health;
2. compare health;
3. allocate resources;
4. apply policies and programmes; and
5. evaluate the services.

One needs a set of indicators which can measure health. Till today, health is viewed as a 'positive' concept; yet most of the indicators by which health is measured are 'negative' ones, such as ill-health or poor health. Health can, therefore, be measured in terms of lack of health, through a set of variables, often referred to as indicators. However, these indicators have to be (a) sensitive; (b) specific; and (c) objective. The commonly used health indicators are listed and discussed below.

1. Mortality Indicators

- (a) Crude death rate;
- (b) Expectation of life at birth/one year of age;

- (c) Infant mortality rate;
- (d) Child mortality rate;
- (e) Maternal mortality;
- (f) Disease specific mortality; and
- (g) Proportional mortality rate.

The mortality indicators only measure final outcomes and do not reflect on the quantum of sickness load in a society.

2. Morbidity indicators

- (a) Incidence rate; and
- (b) Prevalence rate for different diseases or disabilities.

The *incidence rate* takes into its numerator only the new cases of a disease in a specified period and the denominator is the population which is at risk or is exposed. This is generally used for evaluating effectiveness of control measures and also estimating the risk of developing a disease in the community.

The *prevalence rate* has as its numerator the number of existing cases (old+new) of a disease over a specified period or at a point in time and the denominator is the total population. The prevalence rate is helpful in planning and administration and for measuring the magnitude and patterns of diseases and health needs.

3. Nutritional service indicators

Nutrition is the prime indicator of health, especially in the first few formative years of life. Nutritional status is used as one of the principal indicators of positive health and is assessed on the basis of a group of measures such as:

- (a) Birth weight;
- (b) Weight for age;
- (c) Height for age;
- (d) Weight for height;
- (e) Mid-arm circumference; and
- (f) Skin fold thickness.

4. Health care delivery indicators

- (a) Doctor : Population ratio;
- (b) Doctor : Nurse ratio;
- (c) Bed : Population ratio;

- (d) Population per health institution; and
- (e) Population per traditional birth attendant.

5. *Utilization rates*

Health services, with all its vertical and horizontal expansion, should be easily available, culturally acceptable and economically affordable to enable attainment of the goal of health for all by A.D. 2000. The extent to which this is so, decides the utilization rates of these services by the community. The utilization rates of different services give an indicator of the need and demand, and in turn the health status. The rates are:

- (a) Percentage of children under 2 years immunized against diphtheria, tetanus, pertusis, poliomyelitis, tuberculosis and measles;
- (b) Percentage of women using antenatal services;
- (c) Percentage of deliveries conducted by trained birth attendants;
- (d) Bed occupancy rates; and
- (e) Average duration of stay in hospital.

6. *Social and mental health indicators*

- (a) Suicide rates;
- (b) Crime rates; and
- (c) Road traffic accident rates.

7. *Socio-economic indicators*

- (a) Population increase rate;
- (b) Per capita GNP;
- (c) Levels of unemployment,
- (d) Dependency ratio; and
- (d) Adult literacy rate.

8. *Indicators of quality of life*

The Physical Quality of Life Index (PQLI) is a resultant sum of infant mortality, life expectancy at the age of one year and literacy.

HEALTH IN INDIA

Health is a social goal and considered an integral component of the developmental process in the overall planning in India since independence. The importance of health in overall socio-economic development was well recognized and it was an important part of the Community Development Programme, started in 1952.

The Constitution of India, in its Part IV, on Directive Principles of State Policy, states about the right to health:

The State shall, in particular, direct its policy towards securing... that the health and strength of workers, men and women, and the tender age of children are not abused and the citizens are not forced by economic necessity to enter avocations unsuited to their age or strength [Article 39(e)].

The State shall make provision for securing just and humane conditions of work and for maternity relief [Article 42].

The State shall regard the raising of the level of nutrition and standard of living of its people and the improvement of public health as among its primary duties and, in particular, the State shall endeavour to bring about prohibition of the consumption except for medicinal purposes of intoxicating drinks and of drugs which are injurious to health [Article 47].

For the realization of social objectives enshrined in our Constitution, the government initiated five year plans in which health was identified as an important sector. With the sustained efforts in the last 42 years, significant improvement has been registered in the health status of the people. The most dreaded scourge, the smallpox has been totally eradicated; plague is no longer a problem as no human case has occurred for more than 20 years; malaria has been effectively brought under control thus saving millions of lives and its incidence is well below 2 million (1984) compared to 75 million prior to 1950; and deaths due to cholera have been significantly reduced. In a broader context of the changing scenario, the mortality rate too, has been reduced to less than half (27.4 per thousand population in 1951 to 11.8 per thousand population in 1986); the infant mortality from 135 (1973) to 96 (1986) per thousand live births; and life expectancy has gone up to 56 years (1986) from a mere 32 years.

These are no meagre achievements, yet they do not provide any room for complacency. The health situation in India is still a cause for serious concern. The population growth rate continues to be alarmingly high; maternal mortality and child mortality are distressingly high; the per capita caloric consumption is yet to

match the recommended allowances, thus resulting in severe malnutrition, particularly among young children and expectant women; blindness, tuberculosis and leprosy continue to have high incidence. Safe drinking water, which is necessary for controlling the water-borne diseases which account for half of the deaths from communicable diseases, is accessible to only one-third of the rural population and only 0.5 per cent enjoy basic sanitation amenities.

The planned developmental approaches, as documented within the different five year plans as shown in Table 7.1 have resulted in creation of a massive infrastructure of health services down to the village level.

Table 7.1 : Infrastructural achievements in different Plans

	<i>PHC</i>	<i>Sub-centres</i>	<i>CHC</i>
I Plan	725	-	-
II Plan	2565	-	-
III Plan	4631	-	-
IV Plan	5283	33509	-
V Plan	5400	58115	-
VI Plan	5955	65643	-
VII Plan	16954	112103	1469

Source: Health Information—India, 1988 (CBHI-DGHS).

HEALTH PROFILE OF INDIA

India, despite significant changes and improvement in the health situation, still continues to struggle with numerous health problems. Communicable diseases continue to be a major cause of ill-health. The incidence of non-communicable diseases is rising. Malnutrition is widely prevalent and the population explosion has further worsened the situation. On the one hand there is great scarcity of resources and on the other, there is uneven distribution of health care facilities.

The majority of health problems are the products of illiteracy, poverty, ignorance, overcrowding, poor environmental conditions and uneven distribution of health manpower and institutions.

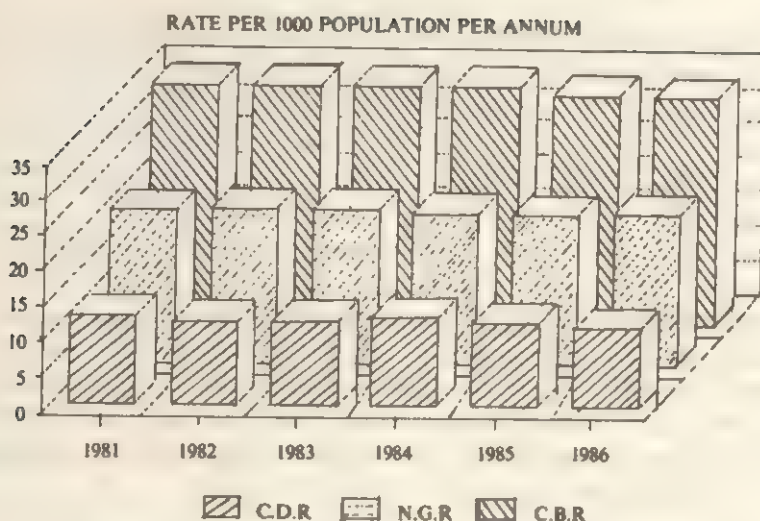
Population Explosion

With only 2.4 per cent of the global land area, India supports around 800 million (1988) people, i.e. about 15 per cent of the world's population; and is the second most populous country in the world. At independence in 1947 we had 342 million mouths to feed and from then onwards the population has been growing at an alarming pace (in just 34 years we produced a second India) with a young population amounting to 40 per cent, thus increasing the dependancy ratio.

With the current growth rate, it is expected to reach the 1 billion mark by the turn of the century. The present situation is a result of uncontrolled fertility and consequent high birth-rate, coupled with a sharply declining death rate. A look at the population trend from 1901 reveals that except for a minor decrease in 1911-21, the year of the big divide, the growth rate has increased from 11 per cent in 1931 to 25 per cent in 1981, with an annual increase by 14 million. India is in the helpless situation where even if each couple today were to stop at two children, the population would still continue to increase [Table 7.2].

Table 7.2: Birth rate, Death rate and Natural growth rate in India, 1901-86

<i>Year</i>	<i>Crude birth rate</i>	<i>Crude death rate</i>	<i>Natural growth rate</i>
1901-11	49.2	42.6	6.6
1911-21	48.1	47.2	0.9
1921-31	46.4	36.3	10.1
1931-41	45.2	31.2	14.0
1941-51	39.9	27.4	12.5
1951-61	41.7	22.8	18.9
1961-71	41.2	9.0	22.2
1971-81	37.2	15.0	22.2
1971	36.9	14.9	22.0
1976	34.4	15.0	19.4
1981	33.9	12.5	21.4



**FIG. 7.1 BIRTH, DEATH & NATURAL GROWTH
RATE IN INDIA, 1981-86**

The mounting population pressure has severely eroded the achievements of our planned development. The economy is severely battered. The per capita availability of food grains has decreased, despite food grain production having trebled in last 30 years. The exploding population, already extirpating available resources, needs additional resource too. It has been estimated that for a single year's increase in population, we need:

11,850,000	quintals of food grain;
180,000,000	metres of cloth;
2,391,000	hours;
121,000	schools;
355,000	teachers; and
3,813,000	jobs.

The country's economy simply can not bear this additional burden, all the more when 50 per cent of the population is below the poverty line [Fig. 7.2].

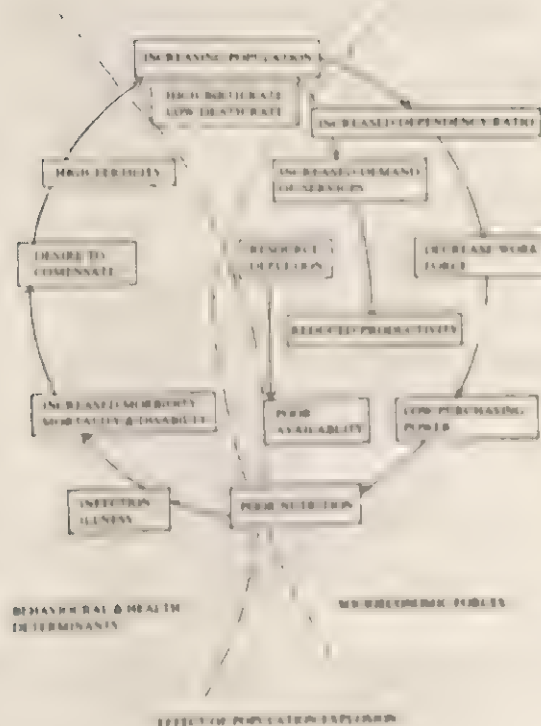


FIG. 7.2 CONSEQUENCES OF POPULATION GROWTH

Not only this, the explosive situation has adversely affected maternal mortality and infant mortality. The per capita expenditure on health has also gone down in the real sense, since 3 per cent of the total budget, which has remained stationary over successive five year plans, is now shared by a larger number of people and is also of less value with high inflation [Table 7.3].

Table 7.3: Plan outlays and expenditure on Health & Family Welfare in different Five Year Plans

<i>Period</i>		<i>Total plan outlays (in Rs. Crores)</i>	<i>Health</i>	<i>FW</i>	<i>Sub-total (2 + 3)</i>	<i>Water supply & sanitation</i>
		<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
I	Five Year Plan (1951-56)	1960 (100.0)	65.2 (3.3%)	0.1 (0.0)	65.3 (3.3)	11.0 (0.56)
II	Five Year Plan (1956-61)	4672 (100.0)	140.8 (3.0)	5.0 (0.1)	145.8 (3.1)	74.0 (1.58)
III	Five Year Plan (1961-66)	8576.5 (100.0)	225.9 (2.6)	27.0 (0.3)	252.9 (2.9)	105.7 (1.2)
Annual Plans (1966-69)		8625.4 (100.0)	140.2 (2.1)	82.9 (1.3)	223.1 (3.4)	102.7 (1.6)
IV	Five Year Plan (1969-74)	15778.8 (100.0)	335.5 (2.1)	285.0 (1.8)	621.3 (3.9)	458.0 (2.9)
V	Five Year Plan (1974-79)	39426 (100.0)	760.8 (1.8)	497.4 (1.3)	1258.2 (2.8)	1091.6 (3.2)
Annual Plan (1979-80)		12176.5 (100.0)	223.1 (1.8)	116.2 (1.0)	339.3 (2.8)	387.6 (3.2)
VI	Five Year Plan (1980-85)	97500.0 (100.0)	1821.1 (1.9)	1010.0 (1.0)	2831.1 (2.9)	3922.0 (4.9)
VII	Five Year Plan (1985-90)	180000.0 (100.0)	3392.8 (1.9)	3256.0 (1.8)	6698.9 (3.7)	6522.5 (3.9)

Figures in parenthesis show percentage to total outlay.

Source: Economic Survey 1987-88, Planning Commission and Ministry of Health & Family Welfare.

Mortality and Morbidity

The death rate, 11 to 12 per thousand population, still continues to be unacceptably high, though it has declined to less than half in the last three decades. Within the country itself, there are wide variations, ranging from 7.2 per thousand in Kerala, to 19.2 per thousand in Uttar Pradesh. The major brunt of mortality is borne by the northern states, namely, Bihar, Madhya Pradesh, Orisa, Rajasthan and Uttar Pradesh. The examination of major causes of deaths reveals that most of the deaths are due to communicable diseases, such as respiratory illness, gastro-intestinal disorder and fever. The recent trends also show a rise in deaths due to non-communicable diseases, such as cancers, cardiovascular diseases, metabolic disorders and accidents [Fig. 7.3].

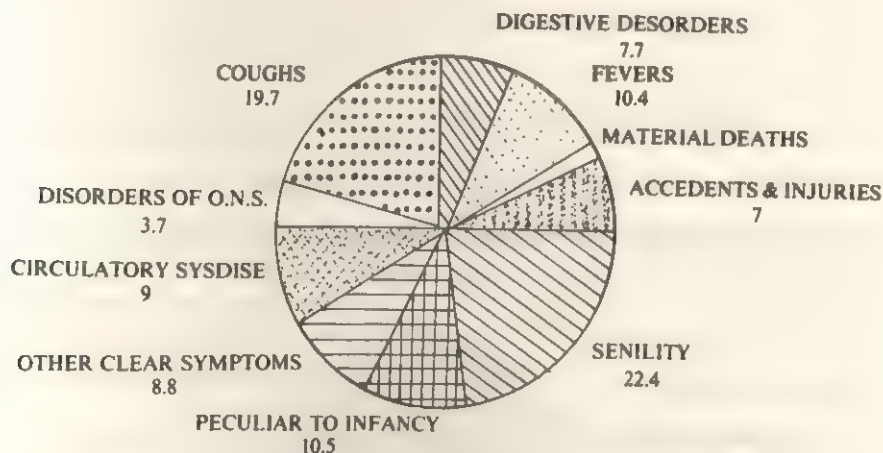


FIG. 7.3 PERCENTAGE OF DEATHS BY MAJOR CAUSES, RURAL INDIA

Infant and maternal mortality

The most affected groups in the population are children and women of child-bearing age. The infant mortality rate (IMR), though steadily declining, yet remains quite high. Of 1000 children born in India, about 100 die during the first year, 40 more die during the second year, 25 in the third year and 10 to 15 in the fourth and the fifth years. In other words, almost one-fifth of the number of children born die before they are five years old. Almost 1.5 million die of diarrhoeal diseases, 1.5 to 2

million die of acute respiratory infections and about 1.3 million die of diseases preventable by immunization, mainly neo-natal tetanus and measles. Malnutrition is a major underlying cause of death, mortality doubling for each lower category of nutritional status. Trends in infant mortality and the distribution of causes are shown in Figures 7.4 and 7.5.

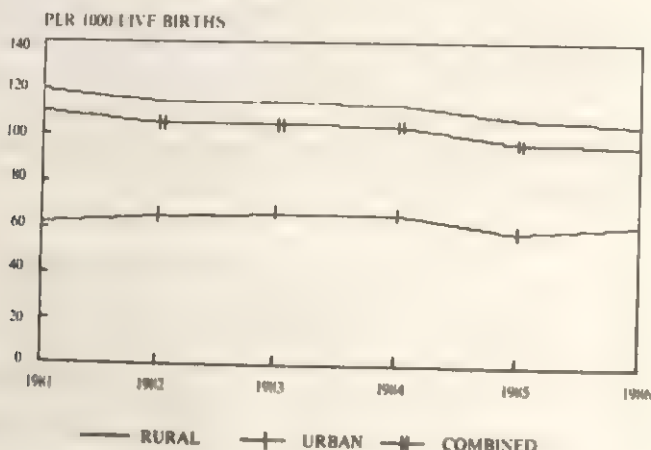


FIG. 7.4 INFANT MORTALITY RATES IN INDIA, 1981-86

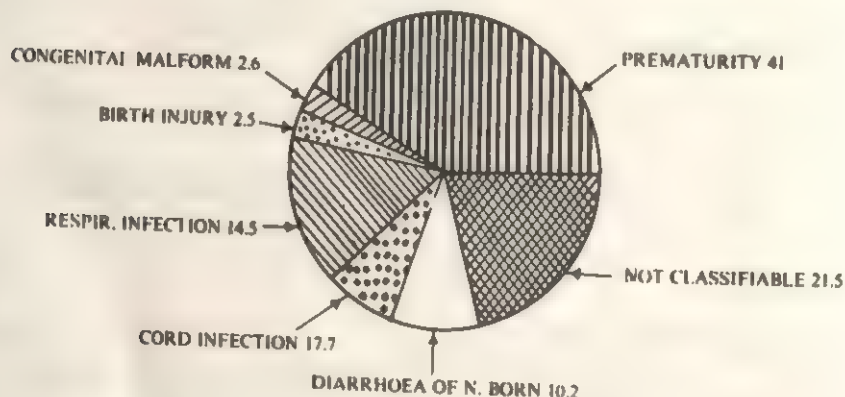


FIG. 7.5 PERCENTAGE DISTRIBUTION OF SPECIFIC CAUSES OF DISEASES IN INFANTS-INDIA, 1986

Table 7.4: Major causes of high IMR in India

<i>Neo natal mortality (0-4 weeks)</i>	<i>Infant mortality (1-12 months)</i>
Prematurity	Enteritis and other diarrhoeal diseases
Low birth weight	Acute respiratory infections
Birth trauma	Communicable diseases—whooping cough
Congenital anomalies	Malnutrition
Hemolytic diseases	Congenital anomalies
Diarrhoeal diseases	
Acute respiratory infections	

The rate of decline in infant mortality is attributed to improvement in socio-economic conditions, control of communicable diseases, better nutrition, obstetric care, immunization against vaccine-preventable diseases, and better health awareness among people. The majority of infant deaths are attributed to factors that are manageable or preventable in nature (Table 7.4).

Besides these direct causes, there are factors, cultural, social and economic, which contribute to high infant deaths. Those are: lower age of mother, order of birth, less interval between two births, large family size, high fertility, unhealthy child rearing practices, low family income, non-availability of ante-natal and natal services, delivery by untrained dais and poor environmental conditions.

Most of these causes could be eliminated by improving the delivery of the comprehensive health-care package of MCH services, with emphasis on timely screening of high risk groups and a strong referral back up.

The other most vulnerable group consists of women of child-bearing age. India belongs to the category of countries, in which maternal mortality, ranging between 5 to 10 per thousand live-births, is the highest in the world. Maternal mortality accounts for more than 1 per cent of total deaths in the country and about 25 to 40 per cent of deaths among women. The major causes of high maternal mortality are

disorders during pregnancy, i.e. haemorrhages (bleeding), toxæmia and puerperal sepsis. Anaemia during pregnancy has a compounding effect which is directly responsible for 20 per cent of maternal deaths and is associated indirectly with another 20 per cent of deaths among child-bearing mothers. The distribution of causes of maternal mortality are given in Table 7.5 and Figure 7.6.

Table 7.5 Maternal Mortality in India, 1976-80

<i>Specific causes</i>	<i>1976</i>	<i>1977</i>	<i>1978</i>	<i>1979</i>	<i>1980</i>
Abortion	11.6	8.2	11.0	11.7	12.5
Toxaemia	10.4	11.2	21.2	16.1	12.4
Anaemia	22.1	15.9	14.6	15.0	15.8
PPH	17.2	20.6	18.2	20.0	15.8
Malposition of foetus	8.4	9.4	9.5	10.5	3.4
Puerperal	13.5	18.8	12.4	11.7	12.4

Source: Survey of Causes of Deaths (Rural), Annual Report, 1986, RGI.

Communicable diseases

Communicable diseases, as mentioned earlier, constitute a major threat to the health of the people in India. Some of them have been mentioned below:

Malaria: At one time (1953), Malaria accounted for 8 lakh annual deaths with 75 million cases every year. This had a devastating effect on the nation's economy and health of the people. This disease was cut to size by 1961, the year which witnessed only 50,000 cases. Thereafter, malaria raised its ugly head again and in 1976 it affected 6.4 million people in the country. With effective control measures it is, however., declining; yet 1.6 million people suffered from malaria in 1987.

Tuberculosis: One of the important public health problems is tuberculosis. It has been estimated that 2 per cent of the total population above 10 years of age have the

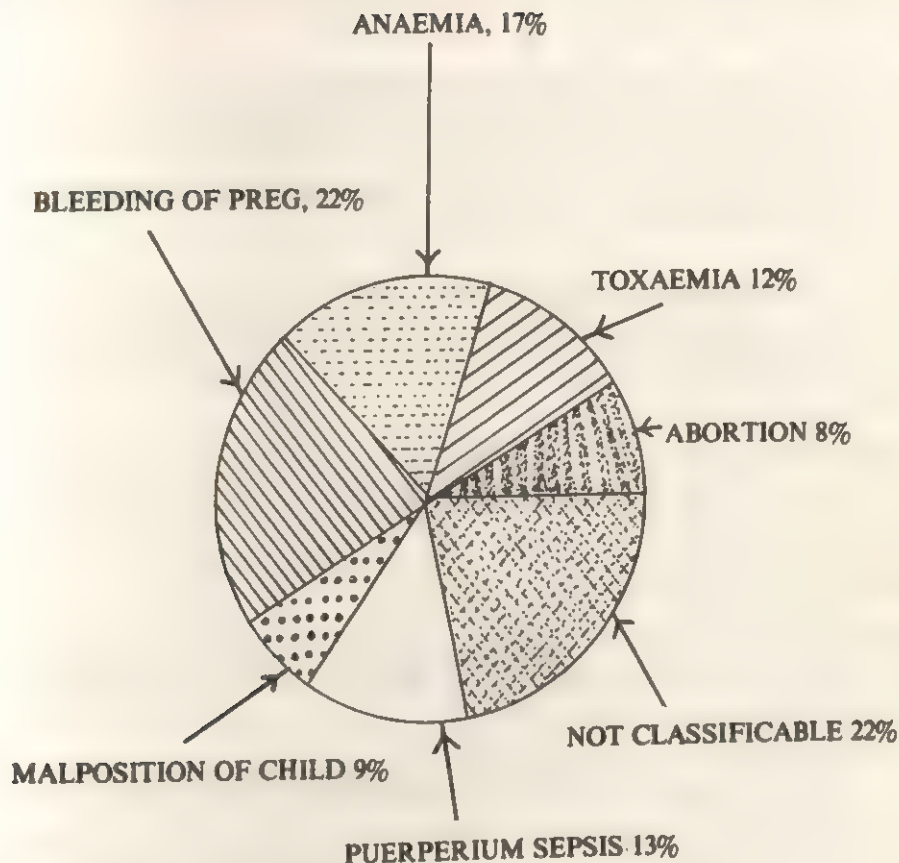


Fig. 7.6 PERCENTAGE DISTRIBUTION OF DEATHS BY CAUSES RELATED TO CHILD-BIRTH AND PREGNANCY (MATERNAL)-INDIA, 1986

tubercular disease. There are about 10 million cases of tuberculosis and approximately 500,000 people die of it every year. However, there are indications of its declining trends.

Leprosy: Though not a fatal disease, leprosy is a leading cause of disability in India. According to estimates and reports available, about 4 million people suffer from leprosy, of which 20 to 25 per cent are infectious. Though the disease is endemic in

the country, almost 50 per cent of leprosy cases are concentrated in the states of Andhra Pradesh and Tamil Nadu.

Poliomyelitis: This is a major crippling disease, especially among young children in the country. About 200,000 children in the 0 to 5 years age-group become disabled due to poliomyelitis every year. On an average, the prevalence rate is approximately 4 per 1000 pre-school children and the annual incidence varies between 1 to 3 per 1000 pre-school population.

Diphtheria, whooping cough, measles and tetanus: These diseases are endemic and their incidence is quite high particularly in childhood. They claim a heavy toll of lives in this vulnerable group and sizeably contribute to high infant and child mortality.

Cholera: Cholera is still a major threat to public health despite the fact that deaths due to cholera have been drastically reduced over the period of the last three decades. There were 86,997 reported deaths due to cholera in 1950, which were reduced to only 2,642 in 1984. However, the disease is endemic and continues to pose a danger of assuming epidemic dimensions.

Diarrhoeal diseases: These claim a heavy toll of lives in India, especially among children below 5 years of age. Over 1.5 million deaths are reported to be due to diarrhoeal diseases every year.

Trachoma: This still remains one of the major causes of blindness. In 5 per cent of the 9 million blind and 45 million visually handicapped, trachoma was the sole cause. The prevalence ranges from 0.5 per cent to 79 per cent in the country.

Sexually transmitted diseases: STDs, especially syphilis and gonorrhoea are almost endemic, and now AIDS joins them. With a very high mortality and virtually no available cure, it is naturally a point of concern. The mushrooming slums, illiteracy, migration, rapid urbanization and prostitution are some of the factors keeping up the endemicity levels.

Besides the above mentioned problems, several other diseases are commonly seen in the country, such as infective hepatitis, typhoid, worm infestations, filaria, guinea worm, kala-azar, meningitis, etc.

Non-communicable diseases

The success achieved in the control of communicable diseases contributed

significantly to higher life expectancy and with that came up a number of non-communicable/metabolic diseases.

Cardiovascular disease: The heart bears the maximum brunt of development; the race to acquire material assets, and changing values, personal behaviour and habits (pollution, smoking, alcoholism, obesity, poor nutrition with more of Grey cells, stress and relatively inactive muscles). Hypertension, coronary heart disease, myocardial infarction, rheumatic heart disease and congenital heart defects, are all on the increase (Table 7.6).

Table 7.6: Incidence of cardiovascular disease in India

<i>Type</i>	<i>% of all cardiac diseases</i>
Rheumatic	30-40
Hypertension	20-25
Ischemic heart disease	11-15
Cor-pulmonale	10-20
Congenital heart disease	2- 5

Diabetes: An estimate of a pilot survey conducted by the Diabetic Association of India indicates its high prevalence of 1 to 7 per cent. It is no more a disease of the elite and of executives. It is slowly but constantly on the rise, with genetic inheritance, acquired obesity and stress as the major causes and precipitating factors.

Cancer: Cancer is now one of the 10 leading causes of deaths in India with an incidence of one per 1000 population. It is a group of diseases characterised by abnormal growth of cells. It invades tissues and eventually causes death (Table 7.7).

Blindness and visual impairment: These diseases have put many people out of the normal stream of life. A sample survey by ICMR (1971-73) indicates a prevalence of 1.5 per cent. The principal causes are identified as:

Cataract	55 %
Trachoma	5 %
Infections	15 %
Malnutrition	5 %
Injuries	1.25 %
Glaucoma	0.5 %

Table 7.7: Cancer prevalence rates by sex - Greater Bombay, 1964-67

<i>Primary site</i>	<i>Males (rates per lakh)</i>	<i>Primary site</i>	<i>Females (rates per lakh)</i>
Tongue	13.8	Cervix	25.1
Larynx	13.4	Breast	20.2
Oesophagus	12.5	Oesophagus	10.8
Stomach	10.2	Stomach	6.2
Hypopharynx	7.8	Ovary	5.7
Prostate	6.8	Buccal mucosa	4.3
Rectum	4.5	Rectum	3.6
Large intestine	4.5	Large intestine	3.5
Mouth	5.0	Larynx	3.1

The National Sample Survey Organisation carried out a population-based survey and reported that 3.47 million (0.5% of the population) were blind in 1981.

HEALTH SERVICES—A CHANGING SCENARIO

India inherited health care services from the British. In the pre-independence era, hardly any public health services existed, and whatever were available were mainly at the time of outbreaks of epidemics or communicable diseases. The services were mainly concentrated in the urban areas and were mostly curative (rather than preventive) in nature. The services were available to only the elite who could afford them. The facilities were practically inaccessible to the rural poor, the masses who needed them most. The Bhole Committee recommendations (1947) ushered in a new era in health care in India. It recommended health care on the basis of the concept of comprehensive health care, enunciating that health services:

1. should be preventive and promotive and not simply curative;
2. should be available to all, irrespective of ability to pay for them;
3. should be made available as close to the beneficiaries as possible;
4. should take care of vulnerable groups in the population, such as pregnant women and children; and
5. should encourage the participation of the community.

The health services started in 1952, were based on these very recommendations and through them significant changes could be achieved in the health situation of the country.

HEALTH FOR ALL

The concept of health underwent revolutionary changes in 1977 when the Annual World Health Assembly created history through a resolution that the main social target for countries should be 'attainment by all citizens of the world, a level of health that will permit them to lead a socially and economically productive life,' the goal being identified with health for all by the year A.D. 2000.

The 1978 conference at Alma Ata (USSR), officially reinforced the resolution and identified the Primary Health Care approach as the key to attain the global goal of Health For All [HFA] by 2000. This was followed by an endorsement from the World Health Assembly in 1979.

The central themes of the approach 'health for all through primary health care' are:

1. a universal coverage with essential health care that is relevant, effective, acceptable, accessible and affordable;
2. community participation in planning, providing and evaluating health care;
3. co-ordination between health and health-related sectors;
4. equitable distribution ensuring availability and accessibility of health services to all sections of the community, rich or poor, urban or rural; and
5. appropriate technology and optimal utilization of resources.

India, being one of the signatories to the Alma Ata declaration, has made a political commitment for attaining this goal to its people, and planners have come out with their concern about positive health and formulated a new health policy.

NATIONAL HEALTH POLICY

The year 1983 proved to be the turning point in the history of health services in India, when an official draft of the health policy was placed before Parliament and was accepted for implementation. This reaffirmed the strong political will to attain HFA and assured the masses of the best possible health policies and programmes to be implemented with their participation, promoting planned and co-ordinated

socio-economic development. The political commitment is reflected in the policy and in the targets it set to be achieved in a phased manner (Table 7.8).

Table 7.8 : Goals for health and family welfare programmes

<i>Indicators</i>	<i>Current levels</i>	<i>Goals</i>		
		<i>1985</i>	<i>1990</i>	<i>2000</i>
Infant mortality rate	Rural : 136 (1978)	122		
	Urban : 70 (1978)	60		
	Total : 125 (1978)	106	87	Below 60
Pre-natal Mortality	67 (1976)			30-35
Crude Death Rate	Around 14	12	10.40	9.0
Pre-school child				
(1-5 yrs) mortality rate	24 (1976-77)	20-24	15-20	10
Maternal mortality rate	4-5 (1976)	3-4	2-3	Below 2
Life expectancy at birth	M : 52.6 (1976-81)	55.1	57.6	64
(years)	F : 51.6 (1976-81)	54.3	57.1	64
Crude birth rate	Around 35	31	27.0	21.0
Babies with birth weight				
below 2500 gm (%)	30	25	18	10
Effective couple protection rate				
(percentage)	23.6 (March 82)	37.0	42.0	60.0
Net reproduction rate	1.48 (1981)	1.34	1.17	1.00
Growth rate (annual)	2.24 (1971-81)	1.90	1.66	1.20
Family size	4.4 (1975)	3.8	-	2.3
Pregnant mothers receiving				
ante-natal care (%)	40-50	50-60	60-75	100
Deliveries by trained				
birth attendants (%)	30-35	50	80	100

Contd. 7.8

Indicators	Current levels	Goals		
		1985	1990	2000
Immunization status				
(% coverage)				
TT (for pregnant women)	20	60	100	100
TT (for school children)				
10 years		40	100	100
16 years	20	60	100	100
DPT (children below 3 years)	25	70	85	85
Polio (infants)	5	50	70	85
BCG (infants)	65	70	80	85
DT (new school entrants				
5-6 years)	20	80	85	85
Typhoid (new school				
entrants 5-6 years)	2	70	85	85
Leprosy (percentage of				
disease-arrested cases				
out of those detected)	20	40	60	80
TB (percentage of				
disease-arrested cases				
out of those detected)	50	60	75	90
Blindness—incidence				
of (percentage)	1.4	1	0.7	0.3

NATIONAL HEALTH PROGRAMMES

Though health is a state subject, even before a national policy for health was adopted in order to combat major diseases and associated morbidity and mortality, various health programmes were undertaken at the national level. A few of them with their salient features are mentioned here.

1. National Malaria Eradication Programme (NMEP)

Distinguished as the biggest health programme in any country against a single communicable disease, the NMEP launched in 1953, yielded spectacular results. Within five years, the number of cases of malaria was brought down from 75 million (1953) to just 2 million (1958). Based on this success, the initial 'control' nature of the programme was converted to 'eradication'. The enthusiasm of eradication lasted only upto 1961 when an all time low of only 50,000 malaria cases were reported. Thereafter, the graph moved up again because of (a) increase in chloroquin resistance; (b) increase in insecticide resistance; (c) poor supply of insecticides; and (d) increase in cost of insecticides.

It reached a peak of 6.47 million cases in 1976. The situation called for shedding of the complacent attitude and indicated the need for a review. As a result, the 'control' nature of the NMEP was restored with modifications and is now known as the 'Modified Plan of Action' (April 1977). This strategy paid off, and the number of cases was brought down to 1.66 million in 1987, a reduction of the order of 74.3 per cent in 11 years.

2. National Filariasis Control Programme

The estimate is that about 360 million people are presently living in filariasis endemic areas. The present strategy of the programme involves the repeated application of anti-larval and anti-parasite measures in urban areas and control through early detection and treatment of the cases in rural areas.

3. National Tuberculosis Control Programme (NTCP)

The National Tuberculosis Control Programme was launched in 1963. It operates through District Tuberculosis Centres. There are about 371 such Centres and 335 TB Clinics. The programme mainly undertakes (a) case finding; (b) treatment of cases; and (c) immunization with BCG vaccine. Under the NTCP all the required drugs are made available free of cost.

The management and treatment of TB has undergone revolutionary changes. Now the patient can take treatment at home (domiciliary treatment) which is as effective as hospitalization. Effective anti-tubercular drugs are made available; and short-term chemotherapy has been developed. These recent developments have greatly helped in the effective planning and control of tuberculosis.

4. National Leprosy Control Programme

The programme was launched in 1955 to initiate the control against leprosy. It became a high priority programme after 1980, when leprosy control activities received a place in the 20-point programme and was renamed as 'Leprosy Eradication Programme'. It aimed at disease-arrest in all the known cases of leprosy by the year A.D. 2000. The programme is operated through a network of 708 Leprosy Control Units, 943 Urban Leprosy Centres, 252 District Leprosy Units and 7400 SET Centres. The major activities under the programme are: (a) early detection of leprosy cases through surveys; (b) treatment with anti-leprosy drugs; (c) rehabilitation, both vocational and social; and (d) health and social education.

5. Diarrhoeal Disease Control Programme

An action plan has been developed to prevent the deaths due to diarrhoeal diseases, including the control of cholera. The major activity under the programme is the promotion of Oral Rehydration Therapy (ORT) through a massive media campaign. The Oral Rehydration Salt (ORS) is supplied free of cost down to village-level to prevent deaths due to dehydration resulting from diarrhoea. It has been found very effective, especially with children, and is reported to have averted a large number of deaths in this vulnerable group.

6. National Guinea Worm Eradication Programme

Guinea worm disease is endemic in a majority of states in India and amounts to a major public-health problem. The Eradication Programme was initiated in 1983-84. The programme undertakes: (a) an active search for cases twice a year at the village level; (b) periodical chemical treatment of water during peak seasons with *Temephos*; (c) personal prophylaxis; (d) health education; and (e) management of the cases.

7. National Programme for Prevention of Blindness

This programme was launched in 1976 with the ultimate aim of reducing blindness in the country from 1.4 per cent to 0.3 per cent by the year A.D. 2000. The operational strategy includes health education, and providing comprehensive eye health care at the existing peripheral, intermediate and apex levels of health care. Two major activities are : conducting cataract operations through mobile eye camps and static units; and prevention of nutritional blindness through supplementation with Vitamin A.

8. Universal Immunization Programme

This programme is a major endeavour in improving the child survival rate in the country. Initiated as the 'Expanded Programme of Immunization' in 1978, it attacks six major diseases of childhood i.e. diphtheria, whooping cough, tetanus, tuberculosis, measles and poliomyelitis. In 1985, the programme changed its strategic approach and emphasis. It was renamed as the 'Universal Immunization Programme' (UIP), focussing mainly on children below the age of 1 year and pregnant women. The programme aims to immunize the child with 3 doses of DPT and OPV, 1 dose of BCG and measles vaccines before the completion of one year of life and provide two doses of tetanus toxoid to all pregnant women. Under the programme, immunization services have been strengthened with material, cold-chain equipment and effective logistics support. The programme is yielding satisfactory results, providing coverage to an average of 50 per cent of eligible children and mothers. As a result of the UIP, there has been a significant reduction in deaths due to immunizable childhood diseases.

Besides these national health programmes, many other programmes are also in operation, namely:

1. National Family Welfare Programme;
2. National Water-Supply and Sanitation Programme;
3. Integrated Child Development Services;
4. National Goitre Control Programme;
5. National Programme for Control of STDs and AIDS;
6. Programme for Prophylaxis against Anaemia; and
7. Minimum Needs Programme.

Population and Nutrition

S.G. SRIKANTIA

Nutrition is an important environmental factor which influences health and well-being. Nutritional status is determined by a number of considerations, and two of the important ones are food intake and infections. The relationship between nutrition and health is a two-way one. Malnutrition can predispose an individual to ill-health and ill-health in turn can adversely affect nutritional status. Malnutrition, unfortunately, is widespread in India and is a serious public health concern. It causes a great deal of suffering to many segments of the population, but particularly to women and children. Malnutrition is also responsible, both directly and indirectly, for the high rate of child death.

All the nutrients needed by man to maintain good health have to come through food—calories, proteins, vitamins, minerals and trace elements. The quantity and quality of the habitual diet therefore determine whether or not sufficient amounts and proper proportions of the nutrients are taken in. The reasons for insufficient intake of food by large sections of the population are several. Family income seems to be the single most important one, since purchasing power largely decides the amount and type of foods that can be afforded. This alone, however, does not explain all aspects of the issue.

FACTORS AFFECTING FOOD INTAKE

Economic Status and Food Intake

In earlier years, malnutrition at the national level was considered to be predominantly a 'food' problem and it was widely held that by increasing the country's food production, the problem of malnutrition could be checked. It is becoming increasingly clear that, while increases in food availability at the national level is a prerequisite for controlling malnutrition, this in itself is not enough; because what determines the habitual diet of a family is its purchasing power, even when the per capita availability increases. Food grain production in India increased almost three-fold, from around 50 million tonnes in 1951 to about 150 million tonnes in 1986, but the increase in population during the period, has to a considerable extent offset the agricultural gains. Despite the increments in the per capita availability, there being more food available per person, the problem of

malnutrition has remained, because the real purchasing power of the lower income groups has not changed much.

As incomes rise, the amount and quality of the food eaten, progressively improve—the better quality being reflected in more diverse foods being consumed and in the inclusion of greater amounts of the so-called protective foods such as milk, fruits and vegetables. As may be expected, beyond a critical level of income, further improvements do not occur. Low-income families spend a much higher proportion of family income on food than the well-to-do. Sometimes this reaches as high a percentage as 80 to 85 per cent.

When purchasing power is so low that it is not enough to meet the food needs of the family, at constant income the family size will determine the amount of food eaten by each member in that family. There is an inverse relationship between calorie intake and family size, in both urban and rural families. Daily intake is below 2000 calories per person when the family size is between five and six, and more than 2000 calories when the family size is smaller—between four and five. This factor is often sufficient to make a difference in nutritional status.

Food Beliefs and Food Taboos: Effects on Food Intake

Important as income is, it is not the only determinant of food intake. Even when incomes permit, there are situations which can limit food and nutrient consumption. Food beliefs and food taboos strongly influence the choice of foods and restrict the use of some food articles, thus compromising nutritional status, particularly of children and women. Many of the food taboos and beliefs are independent of socio-economic status or educational level, but the consequences of practicing these beliefs are felt mostly among the poor, because of the restricted variety which they can afford.

The concept of 'hot' and 'cold' foods is an example. Because of this belief, some foods are not consumed during certain seasons. Also, avoiding certain foods during pregnancy is widely practiced, in the belief that they are harmful to the foetus. Lactating women also avoid some foods in the belief that they are harmful to the baby, since they come into their breast milk. Other foods are included in the belief that they increase milk secretion. Scientific studies which have examined the truth of these beliefs have, by and large, not supported these claims.

Food considered 'hot' in one part of the country, or even by one community, are considered 'cold' in another part and vice versa, supporting the contention that many of these food beliefs are largely culturally determined and pass on from one generation to the next. This, however, is not to say that all beliefs are wrong or to

deny that some individuals show subjective feelings attributable to what are considered 'hot' or 'cold' foods.

Feeding Practices During Infancy: Effect on Food Intake

A lack of knowledge on the part of the mothers about the actual food needs of infants and children is another reason for insufficient food intake, even though there may be sufficient purchasing power. The concept that growing children need relatively more food than adults do is fairly widespread, but its quantitative aspect is not sufficiently appreciated by many mothers. They are often surprised to learn that the amount of food which a two or three-year old child needs, is almost one-half of what an adult man needs. They are also often not aware that because of the bulk, a young child has to be fed small amounts frequently—sometimes in as many as five or six eating sessions—if its needs are to be met. Many children remain underfed as a result of failure to appreciate these two facets of child nutrition.

Two other feeding practices based upon misconceptions contribute to under-feeding during infancy and lead to serious nutritional consequences during the first year of life. The first is the widespread practice, particularly seen in rural families, to exclusively breast-feed infants upto a year or more. Almost 50 per cent of mothers do so. They delay weaning i.e. the introduction of additional food. The second is the practice of giving only token amounts, even when weaning foods are introduced. Many mothers wrongly believe that as long as the child is breast fed, it does not need other foods—a misconception which is the basis of practicing prolonged exclusive breast-feeding. Lack of knowledge about the nutrient needs is the basis of the second practice. For a great majority of infants, breast milk alone is enough to supply nutrient requirements only upto six months of age, no matter how well the mother is lactating. Additional foods must be introduced at the latest by the age of six months. If this is not done, the child's growth will suffer and this retardation cannot be corrected later on.

Feeding Practices During Sickness: Effects on Food Intake

A practice which limits food intake, which again is independent of income, is related to feeding during illness. It is customary to change the type of food and the amount during an episode of sickness. This is an almost universal practice and the change can be best described as putting the person on a 'semi-starvation' diet. The usual solid food is quickly replaced by either a semi-solid or wholly liquid diet in restricted quantities, till the sickness is over and sometimes even well past the illness. The restriction is often severe, amounting to over 50 per cent. This is done not merely in

cases of gastrointestinal infections in which abdominal pain, vomiting and diarrhoea are present, but in every type of infection including simple fevers, coughs and colds. This practice is independent of the economic and educational status of the family, and is frequently suggested and supported wrongly by medical advice. The consequences of this altered feeding schedule are very different depending upon whether the family is a poor one or a well-to-do one. In the better-off households the child is usually well nourished when it develops the infection; prompt medical care is provided which restricts the severity and duration of illness and therefore the duration of semi-starvation. After recovery, the child is encouraged to 'catch-up' by eating of particularly nutritious foods. In contrast, a child from a poor family is already malnourished when it develops an infection; medical care is either delayed or not available, which delays the control of infection and therefore prolongs semi-starvation. 'Catch-up' eating cannot be afforded. Such a child fails to recover the lost ground and does not get back to its original nutritional status. Also, a child from a poor household is predisposed to repeated attacks of infections, unlike one from a well-to-do family, and the repeated semi-starvation episodes progressively worsen the child's nutritional status. Thus, the altered feeding practice during sickness, has little nutritional implications in a well-to-do family but has serious repercussions in a poor one.

An infection by itself is detrimental to nutritional status and the superimposition of the culturally-determined feeding practices can be truly serious. Educating communities particularly women, in the proper feeding of children during sickness, emphasizing that regular diets should be continued through all infections, including gastrointestinal (except the most severe cases), becomes an important component of health education.

Food intake is thus determined by a variety of factors. They include purchasing power, knowledge regarding food needs of individuals (particularly during infancy and childhood), feeding practices during health and particularly during sickness, and food beliefs and food taboos. Since food intake directly influences nutritional status, it is obvious that these very factors affect nutritional status as well.

NUTRITIONALLY VULNERABLE GROUPS

Malnutrition affects all segments of the population; but the risk of developing malnutrition and its health consequences are more serious during some periods of life than at others. The growing foetus during the last three months of pregnancy, the infant and the child up to the age of five years—more particularly up to the age of three years—are at much higher risk than others. These are periods of very rapid

growth and the effects of food deprivation during these periods are more serious than when growth has slowed down. Women, during pregnancy and lactation, are also at increased risk. A pregnant woman needs additional nutrients for two purposes: to support the rapidly growing foetus, and to meet her own increased demands for carrying pregnancy to term. The common saying that an expectant mother should eat for two is however not strictly true. The additional amount of food she needs is roughly one-fifth to one-sixth of what she takes in her non-pregnant condition.

The nursing mother needs additional nutrients mainly because of the breast-milk which she secretes. Contrary to popular belief, the ability of a mother to successfully breast-feed her child is not impaired as a result of malnutrition, unless she is severely malnourished. Practically all rural women in India, even those with mild and moderate degrees of malnutrition, secrete enough milk for their infants to grow properly. They continue to secrete milk upto a year and sometimes even beyond two years, though the quantities become progressively less. The composition of the milk they produce is also satisfactory, except that the concentrations of some vitamins are low, reflecting her own low dietary intake of these vitamins. The additional nutrients which a lactating woman has to take, are primarily to see that her own nutritional status will not deteriorate as a result of her feeding the baby. The additional demands of lactation, during the first six months, are greater than the demands made by pregnancy. She needs to eat additional food amounting to a third or more of her intake before she became pregnant.

The pregnant woman, the nursing woman, the growing foetus, the infant and the pre-school age child are together known as the vulnerable groups from the nutrition standpoint.

NUTRITION AND FERTILITY

Malnourished population are generally thought to have higher fertility rates than do well-nourished populations. This high fertility rate, it has been suggested, sets up a vicious circle. Contrary to this belief, malnutrition, if anything, has the opposite effect—it limits fertility.

Sex Ratio

The sex ratio in a population (number of females per 1000 males) influences fertility rate. In all developed countries, the ratio is over 1000, while in most developing countries, it is below 1000. In India, there are only 935 females per 1000 males in the

total population. There are age-related trends. From birth upto age 12, the ratio progressively falls, it shows a rise thereafter, and from the 25th year onwards, it falls again till the age of 50. The fall is particularly steep between 25 to 35 years of age—an observation which is in keeping with the finding that maternal mortality rate is particularly high after the third parity. At no age does the ratio reach 1000. This age trend is in marked contrast to that seen in developed countries, where right from birth the ratio is over 1000 and slowly rises with age, with an abrupt increase after the age of 50 years.

The decline in the sex ratio in India between 1 and 12 years is due to the higher mortality among female infants and pre-school children, while the fall in the ratio during the child-bearing age is due to the high maternal mortality. Malnutrition plays a considerable role in causing the high mortality rates during these two periods of life. The low sex ratio during the active reproductive period seems to be a characteristic feature of countries which have malnutrition as a public health problem and can limit fertility. What this implies is that if female mortality rates are brought down and the sex ratio rises, the fertility rates will also rise, if other factors remain unchanged.

Age at Menarche

Menarche, the first menstrual period, signifies sexual maturity. Socio-economic status is an important factor which influences the age at menarche. In India, the mean age at which it occurs is higher by about one year, in girls of low socio-economic groups as compared to girls of the high socio-economic groups (14.6 and 13.2 years respectively). Rural girls attain menarche a little over a year later than do urban girls (14.3 and 12.9 years respectively). Nutrition is one of the factors causing these differences. With increasing degrees of malnutrition, age at menarche was found to progressively increase from 13.7 years in normal girls to 15.2 years in severely malnourished girls, within a rural community.

Body weight is an important criterion. On an average, Indian girls attain menarche when they reach a body weight between 32 and 36 kg. Since malnutrition delays the attainment of this weight, it also delays the age at menarche. Even among normal girls, at any given age, those who have started menstruating are heavier and taller than those who have not.

This delay in the age at menarche due to malnutrition, is unlikely to influence fertility rates to any significant extent. What is really relevant is the age at marriage and age at first pregnancy.

Pregnancy Outcome

A woman's ability to conceive is not affected by malnutrition, except when it is very severe. The proportion of women who fall into this category is very small. But, once conception has occurred, both the course and outcome of pregnancy are affected by nutritional status.

Among women in poor socio-economic groups whose diets are poor and who are malnourished, between 20 and 30 per cent of pregnancies end in abortions and miscarriages. Among the well nourished these are negligible. Still-birth and premature deliveries occur far more frequently among malnourished women than among the well nourished. High pregnancy wastage is thus an outcome of poor nutritional status, resulting in lower fertility rates. The reduction is less than what is apparent, because abortions merely delay the birth of the next child. Sometimes within weeks, and often within months following an abortion, women become pregnant again.

Lactation Amenorrhoea

Practically all mothers in malnourished communities breast-feed their babies for long periods of time, because of cultural and economic reasons. Many do so upto two years and some even beyond this age. Breast-feeding delays the resumption of menstruation because of hormonal changes and women who are successfully breast-feeding their children, are relatively infertile. Even when contraception is not practiced, breast-feeding postpones pregnancy. In our country, the mean time-interval between two pregnancies among rural women who do not resort to any family planning method is a little over 30 months. Shortening the duration and frequency of breast-feeding results in quicker restoration of fertility. The mean duration of amenorrhoea in rural Indian women who practice prolonged breast-feeding (upto 30 months) is almost 18 months compared to only 10 months among the urban women who breast-feed only upto 18 months.

Fertility Foods

The belief that certain types of diets or some specific foods alter fertility, has no scientific support. Malnutrition, however, acts as a constraint on fertility. The observation that poor families have more children than do richer families, is because contraception is more often practiced by the latter. This masks the real higher-fertility potential in this group. If the nutritional status of the poor is improved without simultaneously bringing in other socio-economic changes, the result would

be a significant increase in birth rate. This emphasizes the need for an integration of nutrition improvement programmes with fertility control programmes and other developmental activities to ensure that improved nutritional status will not lead to population growth, which would otherwise occur. Also, acceptance of family planning methods may be expected to improve when a higher infant-and child-survival rate can be ensured through improved nutrition. Significant and sustained reduction in birth rates are always preceded by significant and sustained reduction in death rates.

NUTRITION AND CHILD SURVIVAL : IMPLICATIONS FOR FAMILY LIMITATION

The child mortality index in India is over 12 per cent as compared to less than 0.2 per cent in developed countries. This means that 12 out of every 100 children born, do not live to see their fifth birthday. This has important repercussions on life expectancy, the age structure of the population, the child turnover rate and acceptance of the small family norm.

Birth Weights

The birth weight of an infant depends on many factors, of which nutrition of the mother, both before and during pregnancy, is an important one. Mothers from malnourished communities deliver babies with a mean birth weight of 2.7 kg, which is 0.6 kg lower than the mean birth weight (3.3 kg) of babies delivered by mothers of well nourished groups. Premature and still births are much more common among malnourished mothers. Also, twice as many babies born to mothers from malnourished populations have birth weight below 2.5 kg. These differences, attributable to socio-economic differentials, are world-wide phenomena and affect infant survival and growth.

The reasons for the low birth weight of babies born to undernourished mothers are two-fold. One is the insufficient food intake during pregnancy. This can be corrected to some extent by providing enough food even in the late stages of pregnancy—the last 6 to 8 weeks. The other is the low weight and height of the woman at the time of pregnancy. If a woman weighs less than 38 kg before pregnancy, less than 42 kg during the last month of pregnancy, and if she is less than 145 cm in height, the chances of her having a low-birth-weight baby are very high. Close to 20 per cent of Indian rural women and women in urban slums fall into these categories. The women are short and underweight because they were malnourished during their early childhood. Their short stature cannot be corrected.

Infant Mortality Rate

The infant mortality rate in our country is currently about 100, a figure which is lower than the 140 which was reported a few years ago. There is a rural-urban difference, it being always higher in the rural areas. Many of the infant deaths—close to 50 per cent occur during the first month of life (neo-natal deaths). Prematurity and low birth weight are the most important causes. They increase the risk of fetal infections. In addition, low-birth-weight babies do not grow as well, as do normal babies. Coupled with delayed weaning and insufficient feeding, many of them become malnourished, develop severe infections and die during the second half of infancy. Not all the blame for infant mortality can be attached to malnutrition. Other poverty-related causes, such as insufficient obstetric care, poor environmental sanitation, over-crowding, unsafe drinking water and lack of timely medical care also contribute to high infant mortality.

Child Mortality Rate

Malnutrition is also responsible for a number of deaths among older children. Two out of every 100 children in the 1 to 5 year-old group die. Some die because of severe frank deficiency diseases, while others die because of diseases supported by malnutrition—diarrhoea, bronchopneumonia, measles, tuberculosis and viral infections.

This high child mortality promotes the desire in rural communities to have more children than they actually want and creates a resistance towards the small family norm. Parents of children who die in infancy usually have another child within the year, sooner than they otherwise would have. This increases the birth rate; it also shortens the inter-pregnancy interval. This short interval, apart from placing the mother at risk of becoming malnourished, also leads to the delivery of a low birth-weight infant. The child turnover rate becomes high and this is one of the reasons for the country's high child population—a vulnerable group which needs special nutrition care. A vicious circle becomes operative (Fig. 8.1).

FAMILY SIZE AND NUTRITIONAL STATUS

As indicated earlier, family size may be expected to determine the amount of food available to each member of the family and therefore nutritional status, particularly when income is limited. There is in fact an inverse relationship between family size and nutrient intake. Among families with two adults and three children or less, the

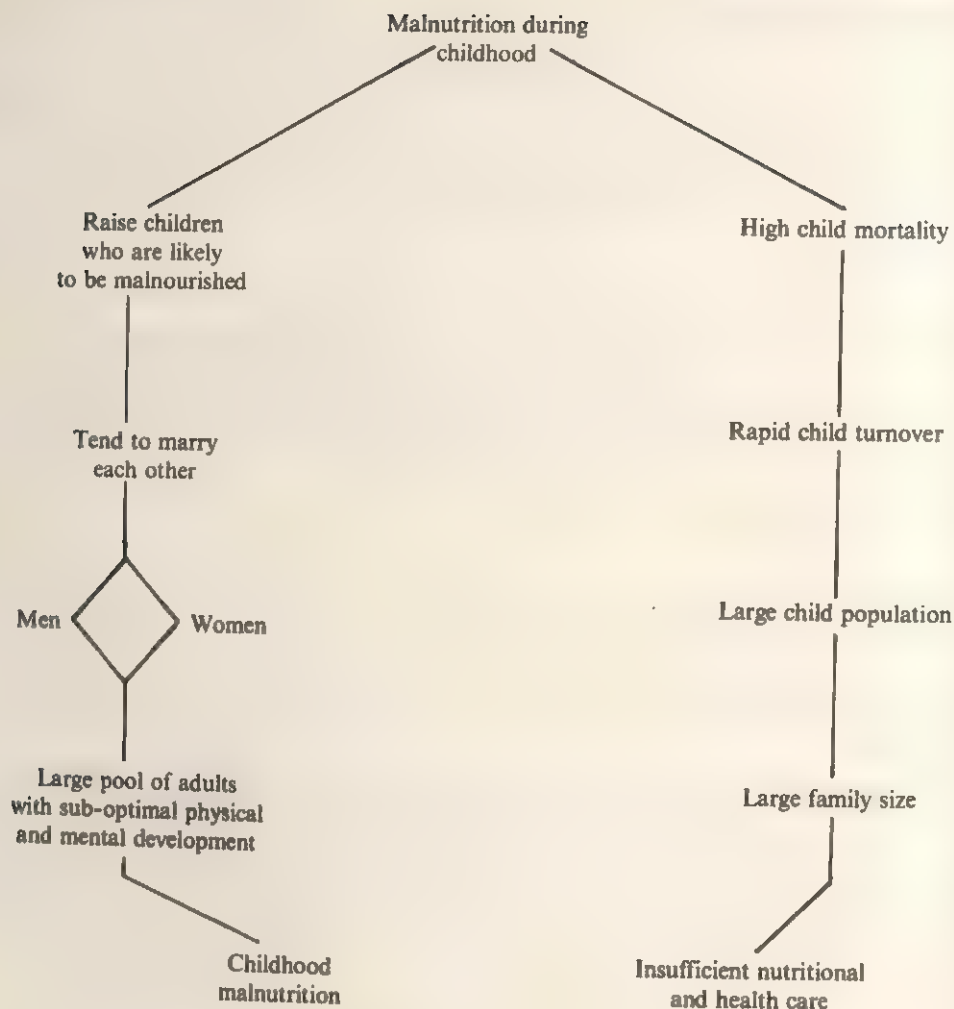


FIG. 8.1 VICIOUS CIRCLE OF CHILD MORTALITY

mean intake of calories and protein is higher than that of families consisting of two adults with four or more children. The difference in calorie intake is close to 300 and that in protein intake is about 10g per day. In close to 60 per cent of families these differences mean either sufficiency or insufficiency of nutrition. This is reflected in differences in nutritional status particularly of children and pregnant women.

Over 60 per cent of children who suffer from severe protein-energy malnutrition (which has a high fatality rate) come from large families and their birth orders are 4 or above. Less than 40 per cent of the first three born have such severe malnutrition. The growth status of children in large families is also less satisfactory than those of children in small families. Children with birth orders of three or below are almost 4 cm taller and 1.5 kg heavier than are children whose birth orders are 4 or above. Clinical signs of deficiency diseases are also seen more frequently among children from large families. Mild protein-energy malnutrition and vitamin A deficiency are seen in twice as many children whose birth order are 4 and above as compared to the earlier born.

The number of pregnancies a woman has, influences her nutritional status. Of all the women who have deficiency signs, almost two-thirds are those who have had 4 pregnancies or more. Also, anaemia and signs of deficiency of B-complex vitamins occur twice as frequently in women who have been pregnant four times or more, as compared to those who have had fewer pregnancies.

On the basis of these observations, it has been suggested that if the number of children in a family is restricted to a maximum of three, almost 60 per cent of malnutrition among young children and pregnant women can be eliminated without any other effort. The nutritional benefits are likely to be even more because the food and child care now going to the later born, would be diverted to the first three children, further reducing the quantum of malnutrition. It has to be recognized that limiting the number of children cannot be done in isolation; but when it can be achieved, the nutritional benefits can be substantial.

SOME COMMON NUTRITIONAL DEFICIENCY DISEASES AND THEIR HEALTH CONSEQUENCES

Malnutrition—Primary and Secondary Causes

If a nutritional disorder develops because the intake of a nutrient through food is insufficient, it is described as having arisen from a primary deficiency. This can only be corrected by improving the dietary intake of the nutrient. Not infrequently

nutritional diseases develop, even when dietary nutrient intakes are enough, because there are other reasons. Such cases are described as having arisen from secondary deficiencies. Important among the reasons for secondary deficiencies are: infections, defects in absorption, increases in losses of nutrients and, occasionally, medicines taken to control other diseases. In such cases correction is best achieved by removing the secondary cause, although improving intakes will also help. In practice, both are done.

Stages in the Development of Deficiency Diseases

There is usually a time-lapse of several days or weeks after intakes of nutrients are lowered and before the disease becomes evident. There are several stages in between. The first stage is when the body-stores of the nutrient are reduced (depletion stage). This is followed by changes in the tissues (including blood), although there is still no visible change (biochemical or subclinical deficiency stage). Laboratory tests will, however, show that changes have set in. When this situation has persisted for some time, actual signs and symptoms, which are easily seen, make their appearance (clinical stage). If in a community or population group there are several people with clinical disease, it is presumptive evidence that there will be many more with biochemical deficiency and even more in the depletion stage. The nutritional status of that population is, clearly, unsatisfactory. Corrective action needs to be initiated not merely for those who actually have the disease but for the community as a whole.

In our country large number of people suffer from advanced clinical stages of many nutrient deficiencies indicating that all is not well with our population groups. There are wide regional variations in the extent and nature of the nutrient deficiency disorders. Some however are common to most parts of the country and are of serious public health concern. Four such diseases are briefly described here: protein-energy malnutrition in children, vitamin A deficiency, anaemia, and goitre due to iodine deficiency. They all share some common features. They are widespread, they contribute to increased illness and death, and they affect the quality of life by interfering with physical, social and mental development. Also, they are all completely preventable—the knowledge and the means of doing so are available.

Protein-Energy Malnutrition

It was earlier believed that this disease among children came from their eating foods which did not have enough protein. This belief is incorrect. The diets of children of even poor families have a protein concentration which is satisfactory in spite of being predominantly vegetable-food based. The reason for this disease is that these

foods are not eaten in sufficient amounts and this food-gap leads to secondary protein deficiency because, in the absence of sufficient calories, some of the protein is used for the purpose of providing energy. This has very important implications in the treatment, control and prevention of the disease.

Anywhere between 3 and 5 per cent of children below the age of five years living in rural India and urban slums have the serious clinical forms of protein-energy malnutrition and, if not promptly treated, will die. Several hundred thousand children die of this condition every year in our country. This figure of 3 to 5 per cent is a high one, but it is only the tip of the iceberg — over 70 per cent of children in this age group suffer from mild and moderate forms of the disease. Unlike in the severe clinical forms, there is nothing dramatic to observe in these mild and moderate cases. They show growth retardation, which can easily be missed except by the trained eye. A four year-old malnourished child will be shorter and lighter than what he should be for his age, and will look like a normal three year old child. Unless the age is known, he will pass off as a younger normal child. With a child population of nearly 110 million in this age group and almost 75 per cent of them living either in rural areas or urban slums, this means that over 50 million children in the country are malnourished. The seriousness of this lies in the fact that many of these children will have varying degrees of social and mental underdevelopment which persists in their adult lives. They also grow up into small-sized adults, with low stamina, low physical-work-capacity and therefore low productivity. The small size sometimes restricts their earning capacity.

There are marked differences in the body size of adults, depending on their socio-economic status. The rural adult man has an average height of 160 cm and an average weight of 52 kg, both of which are much lower than those of adults who come from well-to-do sections of the population. The rural adult woman is just 152 cm tall and weighs a mere 42 kg. This short stature and low weight has special significance for women because they influence the birth weights of their infants; and low birth weight, as indicated earlier, is related to infant mortality.

Diet survey data from many parts of India show that almost one-third of the children in poor families do not eat enough food needed for normal growth. On top of this, the poor environmental sanitation around them predisposes them to infection. Thus both primary and secondary causes act together to produce malnutrition. Some maternal characteristics add to the problem. Even among the poor families, not all children suffer from malnutrition, and this can be related to differences in maternal qualities. Though they all come from the same rural, poor socio-economic strata, they differ in their knowledge about food, nutrition and health problems, their resourcefulness (their ability to make best use of existing

facilities), their concern for the welfare of their children, their interaction with their infants and children, as also their general intelligence as judged by psychological tests. Mothers whose children are malnourished have lower scores in all these areas as compared to mothers whose children have no malnutrition. Maternal attributes therefore play an important role.

Vitamin A Deficiency

Of all the vitamins, deficiency of vitamin A is the most serious in our country, though it is not the most common. In its mild form, vitamin A deficiency interferes with the ability to see in dim light (a condition known as night blindness) which can be totally corrected by giving the vitamin. It can also lead to the development of greyish-white patches on the conjunctives (Bitot spots) which also is curable. In its severe forms, vitamin A deficiency damages the eye, leading to blindness which cannot be corrected (Keratomalacia). Vitamin A deficiency signs are rare below the age of one year and it affects mostly children upto the age of five. Older school-going children are also at risk.

Between 2 and 4 per cent of children in rural areas and urban slums have signs of mild vitamin A deficiency. The exact figures for the severe forms are not known with certainty, but it is calculated that about 30,000 children go blind every year as a result of vitamin A deficiency. The disease has now acquired a new dimension following the finding in some developing countries that even mild vitamin A deficiency increases the risk of mortality in young children. The public health importance and social repercussions of vitamin A deficiency are obvious.

The major reason for this disease is the fact that the diets of poor rural households do not contain enough vitamin A. Vitamin A is present only in foods of animal origin, which are beyond the reach of the poor. Vegetarians depend upon foods which contain B-carotene for their vitamin A requirement. This is contained in all fruits and vegetables which have a yellow or green colour, and is converted to vitamin A in the body. What is unfortunate is that these relatively inexpensive dietary sources of vitamin A are not included in the diets of young children because of either ignorance or food taboos and beliefs.

Anaemia

The magnitude of the problem of anaemia is second only to that of protein-energy malnutrition. For a long time it was believed that anaemia was mostly a disease of women during their reproductive age (15-45 years). It is now known that anaemia occurs in people of all ages of both sexes right from infancy. Over 70 per cent of

young children, 65 per cent of adult women and 45 per cent of adult men in our country have varying degrees of anaemia. Pregnant women, are the worst sufferers; almost 75 per cent have the disease.

The problem is less severe in urban than in the rural areas. The most important cause of anaemia is deficiency of iron. Though the diets of even the poor contain fairly good amounts of iron, deficiency develops since much of this iron cannot be absorbed because of the nature of the diet.

Anaemia reduces work capacity and productivity, which is particularly important in the context of the agricultural economy of the country. If anaemia is severe, it affects the growth and development of infants. It also affects the intellectual functioning of children. Even when anaemia is mild, it shortens attention span and lowers the ability to concentrate. Anaemic subjects therefore perform poorly in mental tasks which depend heavily on these two inputs. Anaemic children tend to show poor scholastic achievements.

Moderate to severe anaemia during pregnancy leads to the delivery of infants with low birth weights in addition to contributing to maternal mortality.

These health consequences of anaemia make the disease a problem of serious concern.

Goitre and Iodine Deficiency Disease

Goitre is caused by deficiency of iodine and results in a visible enlargement of the thyroid gland which is situated in the neck. Unlike the previous three diseases, it is not found uniformly all over the country. Iodine deficiency is most often primary, there being insufficient intake through water and food. Secondary deficiency also occurs due to the presence of substances in the diet known as goitrogens. These substances interfere with the utilization of iodine in the body.

According to recent estimates about 40 million Indians have goitre. They are mostly seen in the goitre-belt, which stretches across the entire sub-Himalayan area. This includes parts of Jammu and Kashmir, Himachal Pradesh, Punjab, Haryana, Bihar, Uttar Pradesh, Meghalaya, West Bengal, Tripura, Manipur, Nagaland and Arunachal Pradesh. New goitre zones have recently been identified in Maharashtra, Madhya Pradesh and Karnataka.

Apart from causing visible and ugly enlargement of the thyroid gland, iodine deficiency has serious health implications for infants, children and pregnant women. About 15 per cent of school children in some goitrous areas have varying degrees of mental underdevelopment. About the same proportion of infants have

biochemical abnormalities indicative of potential underdevelopment. Severe iodine deficiency during pregnancy results in the birth of incurable deaf-mute infants.

Besides these four major nutritional diseases, large sections of the population suffer from deficiencies of the vitamin B-complex group. Though widespread, this deficiency does not have the same degree of serious health consequences. Deficiencies of vitamins C and D do occur but are not of a magnitude to be considered public health problems.

GENDER DIFFERENCE IN FOOD INTAKE AND NUTRITIONAL STATUS

It is widely believed that in many households, particularly when the family is poor, boys and men enjoy preferential treatment over girls and women in the matter of food. The higher mortality and morbidity seen among girls and the higher incidence of the severe forms of malnutrition among girls have been ascribed to this discrimination in food intake. The overall sex ratio in the country is against the female. There are only 935 females for every 1000 males except in the state of Kerala where it is 1035. This has also, in part, been attributed to nutrition, because it is again widely believed that the nutritional status of women is less satisfactory than that of men leading to higher mortality among women.

These beliefs are based more upon impressions than on reliable scientific findings. While it is true that death rates among females throughout childhood and the reproductive age of 15 to 45 years are higher than in males, national diet survey and nutrition survey data, by and large, do not show that the dietary intakes and nutritional status of girls are less satisfactory than those of boys. These findings do not support the popular view that in the matter of food distribution within the family, even among the poor, parents discriminate against the female. That there is perhaps no discrimination in food allotment, is confirmed by the finding that the profiles of growth of boys and girls are similar. Among adult men and women too it is seen that neither with respect to food intake nor with respect to nutritional status are women worse off than men in rural communities. These findings do not imply that the matter is settled because in some areas and in some communities there is evidence that discrimination in food intake exists and that the nutritional status of women is worse than that of men. In view of the serious sociological and national implications, it is necessary to examine this question in depth.

The higher mortality rates in women and the higher incidence of severe malnutrition among girls have to be explained as being related to factors other than food and nutrition. It has been repeatedly seen that there is obvious discrimination

in the matter of health care. During sickness more boys are taken to the hospital more promptly for 'good' medical care than girls. More girls are taken to less qualified village 'doctors'. Among children who need medical attention but do not get it, girls constitute a higher proportion. Discrimination against girls usually increases as their number in the household increases. This may explain why, even when there is no significant discrimination in the matter of food, more girls than boys develop the fatal, serious forms of malnutrition. There seems to be an even greater discrimination with respect to schooling, literacy and vocational training — all of which in later life contribute to shortcomings in maternal attributes which influence child rearing, including good nutritional status. In recent years it appears that the extent of discrimination is decreasing.

NATIONAL NUTRITION PROGRAMMES

Realizing the importance of nutrition in health and national development, the central and state governments have initiated several country-wide programmes to improve the nutritional status of the population. Some of these are direct nutrition interventions aimed at eradicating the major, widespread specific deficiency diseases. Others are indirect nutrition programmes which help to improve overall food consumption, both in terms of quantity and quality.

Agriculture-related programmes which promote food production, and schemes which provide subsidized foods to the poorer sections come under the indirect category. Anti-poverty schemes such as the food-for-work programme, employment guarantee schemes, other income-generating plans and developmental activities also fall into this category. So do efforts aimed at nutrition and health education. The recently launched Universal Immunisation Programme which envisages the protection of all children against diphtheria, tetanus, whooping cough, tuberculosis, measles and poliomyelitis, should also be looked upon as an indirect nutrition programme because by reducing these infectious diseases, it can promote better nutrition. The importance of this, however, should not be overestimated, because these immunizations do not take care of the most common and important infections — respiratory, gastro-intestinal and other viral diseases. The Family Welfare Programme is also an indirect nutrition programme since by reducing family size, it will not only increase the per capita availability of food but also result in better all-round facilities, including health care.

A unique approach to improve child survival, child nutrition and child development is the Integrated Child Development Services (ICDS). Started in selected parts of the country about a decade ago, it offers a package of services aiming at all-round child improvement.

Several direct nutrition intervention programmes have been in operation for several years, long enough to have made an impact. The rationale behind these programmes and their effectiveness are briefly presented here.

Special Nutrition Programme (SNP)

Started in the early 1970s, this programme aims at the control and prevention of childhood protein-energy malnutrition in the age group 1 to 5 years. Free food supplements are given, usually of the ready-to-eat type. Children in the urban slum and the tribal areas are primary targets. The amount of food given is approximately equal to the shortfall between what the child needs and what it actually eats at home (300 calories and 10% of protein). As far as possible, the food supplement is prepared using locally available food stuffs. The food is given for not less than 200 days in the year.

Mid-day Meal Programme

Initially started in Tamil Nadu, and later taken up by a few other states, this is meant for school children. A complete meal is served in the afternoon. The aim is to improve nutritional status, increase school enrolment, reduce school dropouts and create nutrition-awareness among the children and parents.

Vitamin A Prophylaxis Programme

This intervention aims at reducing blindness due to vitamin A deficiency among 1 to 5 year old children. All rural, tribal and urban slum children at risk are given a very large single dose — 200,000 units of vitamin A in syrup form once every six months. The vitamin A is distributed through the existing primary health care system. This programme was started in 1972, and was based upon extensive studies done in the country earlier, which established the fact that vitamin A deficiency blindness could be eliminated through this simple, inexpensive procedure. Several million children are covered under this programme.

Anaemia Prophylaxis Programme

Initiated over ten years ago, the purpose of this programme is to reduce anaemia in two selected high-risk groups—pre-school children and pregnant and lactating women. Tablets containing iron and folic acid (another nutrient whose deficiency contributes to anaemia) are given to pregnant women during the last 100 days of

pregnancy, to lactating women during the first six months and to children for 100 days in a year. The dose is one tablet a day. This programme like the Vitamin A Prophylaxis Programme is operated through the primary health care network.

Goitre Control Programme

Common salt to which iodine is added (iodized salt) is made available in areas which have goitre, with the aim of reducing the number of people with goitre as also to bring down the extent of iodine deficiency disease. The ability of iodized salt to control goitre has been established the world over.

Integrated Child Development Services (ICDS)

Started a little over ten years ago in select areas, the ICDS has now been expanded to cover over one-half of the country. Child protection and child development are the central objectives. The package of services include: (i) health check-up of children, pregnant and lactating women, (ii) immunization; (iii) supplementary feeding of children, pregnant and lactating women, (iv) medical referral service, (v) non-formal education to pre-school children; and (vi) health and nutrition education to mothers. Children from birth to 6 years of age are included. The services are delivered through the 'anganawadi' as the focal point.

An Evaluation of These Programmes

All these programmes have been evaluated and the findings of the latest evaluations are indicated in Table 8.1.

A common remark in the evaluation of these programmes is their tardy implementation and lack of adequate supervision during implementation. Wherever they have been properly implemented, the anticipated improvements have occurred. Unfortunately such 'success' areas are few.

Child survival programmes are important in the context of bringing down population growth; but if, concurrently, child development programmes are not implemented, there may soon come a time when the nutritional status may become worse than what it is now because of increasing numbers of survivors who do not have an opportunity to grow and develop optimally. The child development component has not received the same emphasis in the country as has the child survival effort.

Improving the nutrition of people is vital for improving the health of the nation

Table 8.1: Evaluation of Nutrition Programmes

<i>S. No.</i>	<i>Programme</i>	<i>Findings</i>
1.	Special Nutrition Programme	Some reduction in the severe forms of malnutrition. Total impact is much less than expected.
2.	Mid-day Meal Programme	Has not achieved its nutritional and educational objectives.
3.	Vitamin A Prophylaxis Programme	Has reduced Vitamin A deficiency signs only in patches. Impact is less than expected
4.	Anaemia Prophylaxis Programme	Has had virtually no impact.
5.	Goitre Control Programme	Has failed to make any significant impact in many areas.
6.	Integrated Child Development Services	Some impact on immunization status as also nutritional status of children. Child mortality rates reduced. Disappointing with respect to others.

and for national development. This can be achieved, not in isolation, but as part of a well-implemented package of services which includes all aspects of socio-economic well-conceived development.

SUMMARY

1. A large section of India's population is malnourished, not merely because of economic reasons, but also because of lack of knowledge about food and nutrient needs as well as wrong feeding practices due to food beliefs and food taboos. This is particularly true during periods of sickness. Though all segments of the population are affected, infants, young children and pregnant and lactating women are especially at risk and constitute the vulnerable groups.
2. Malnutrition contributes substantially to infant and child mortality in the country. This has several demographic repercussions. It increases birth rate and child turnover rate which promote large families. It shortens inter-pregnancy interval and generally discourages the adoption of the small family norm. It also increases the proportion of child population, thus straining the country's limited resources, since children form a large vulnerable group.

3. Family size has a perceptible influence on food intake and nutritional status, particularly of women and children. There are more malnourished subjects among large families than among small families. Also, children with birth orders of four and above, have twice as much malnutrition as do children whose birth orders are three or below. Women who have had more than three pregnancies are more malnourished than are women with fewer pregnancies. Malnutrition in the country can come down by over 60 per cent, if families restrict the number of children to two or three, even if nothing else is done.
4. The consequences of childhood malnutrition are far reaching. They include impaired physical and mental development, which persist in adult life leading to small adult body size, reduced work capacity and productivity, low earning power and low quality of life. All these perpetuate malnutrition. Its consequences in young girls include unsatisfactory reproductive performance and sub-optimal child rearing when they become adults.
5. Malnutrition limits fertility.. This is contrary to the general belief that malnutrition promotes it. It limits fertility by reducing the population sex ratio through more female deaths during infancy and childhood, as also more maternal deaths during the reproductive period. Prolonged lactation, which is practiced extensively by poor malnourished communities, also contributes by delaying the resumption of menstruation and prolonging the inter-pregnancy interval. Menarche is delayed by malnutrition, but has little role in influencing fertility.
6. Four nutritional disorders are of public health concern in the country—protein-energy malnutrition, vitamin A deficiency, anaemia and iodine deficiency. They contribute significantly to mortality and ill-health; they also lead to deficits in physiological functions. The several nutrition programmes both direct and indirect, which have been in operation for quite some time, have made only a marginal impact, mainly because of poor implementation.
7. All child-survival programmes in the country are linked to child-development programmes, but the latter have not received the same attention and emphasis as the former. If this situation is not rectified, there may soon be a time when the nutritional status may get worse than it is now, simply because of an expanding surviving pool of malnourished individuals.
8. Improvement of nutrition is vital in improving the health of the nation and for national development. This can be achieved not in isolation, but only as part of an integrated package of activities which includes all aspects of socio-economic development.

RECOMMENDED READING

1. *Growth and Physical Development of Indian infants and children*, Technical Report Series No. 18, Indian Council of Medical Research, New Delhi, 1984.
2. National Institute of Nutrition, Hyderabad, *Annual Reports*, 1970 to 1986.
3. *Annual Reports of the National Nutrition Monitoring Bureau*, National Institute of Nutrition, Hyderabad, 1975-80, 1984.
4. *Combating Malnutrition*, Edited by G. Gopalan, The Nutrition Foundation of India, New Delhi 1986.

SECTION - VI
FAMILY LIFE

Family Life Education : Aspects Of Human Sexuality

MAHINDER C. WATSA

INTRODUCTION

Every society has evolved its own ways of preparing its younger members for adulthood primarily through an educational process, now generally known as the family life education. Traditionally, most elements of family life education have been informal, taking place in the home, place of worship, education and work, and in every day contacts with other people.

In some cultures like among our tribals, rites or initiation ceremonies mark the leaving of childhood and the beginning of access to knowledge and privileges that are permitted only to adults. Through the process of socialization and education through observation of people's behaviour and the ways in which others respond to it and through their own experience, children and adolescents become thoroughly familiar with the norms, customs and values of their society, and these provide the guidelines for their own behaviour. They acquire the knowledge they need to lead adult life, and they learn the consequences of transgressing accepted codes of conduct. The child learns about life, because life itself educates.

It is not surprising that families in many parts of the world are finding that the task of helping young people prepare for adult life is becoming increasingly difficult often they have as little experience as their children of the opportunities or problems they are facing.

Schools and voluntary youth organizations are part of this process of change; in some respects they replace traditional forms of education and guidance, yet they can also assist people to adjust to change. The development of organized programmes of family life education is one expression of their willingness to work together with families to assist young people in their transition from childhood to adulthood.

WHAT IS FAMILY LIFE EDUCATION

Family life education is concerned with learning about living, family and social relationships and personal development. It is not simply concerned with the transfer of information and values, but aims to assist people in developing the ability to

understand themselves and the society in which they live, to learn to think independently, to work out and clarify their own values and to evaluate and use information effectively in making responsible decisions about their lives.

Family life education should not be confused with family planning education or sex education, although these are usually considered to be its important components. Sex education focuses largely, though not exclusively, on the individual—on self awareness, personal relationships, human sexual development, reproduction and sexual behaviour.

In family planning education, the focus is primarily on the family as a group of people with complementary roles and needs. It is concerned with the concept of planning in relation to childbearing and parenthood.

'Family life education may be defined as education for human development which seeks to ensure that each individual approaching adulthood is equipped with the skills and personal reserves to cope with the challenges of everyday life in society, within acceptable societal structures, and to adapt to change with experience and equilibrium'.

Family life education includes a study of self awareness, understanding of others, of sexuality, marriage and parenthood. The knowledge gained and skills developed will contribute to the individuals ability to cope both with social change and with relationships in society as a citizen, spouse or parent.

(Formal definition adopted at IPPF/WCOTP Seminar on Teachers and National Development with special reference to Family Life Education, Lesotho, 1978).

THE NEED FOR FAMILY LIFE EDUCATION

Whatever the differences in its structure and its functions, the family has always existed as a basic social grouping among human beings. There is of course no universal pattern: families may be nuclear or extended, monogamous or polygamous. They may be bound together by birth, marriage, adoption, love and affection or economic or social advantage. The forms which families take are historical products of the culture, the religion and the political, social and economic organization of the societies in which they exist. These factors also influence the

ways in which the functions of families have evolved and the means by which they attempt to meet the physical, social and emotional needs of their members.

But in most parts of the world, the structures and functions of the family are in transition and its educational role is one which is particularly subject to change.

Many adolescents are growing up in a world in which they will have to make more decisions for themselves than any previous generations. They experiment more, make choices and take risks, and learn by their own experiences rather than by those of others. Many are able to face change with confidence and with a vision of a better life in the future which they can build with their own efforts.

Yet for others the result is confusion, frustration, despair and risk-taking of a kind which is ultimately self-destructive. In industrialized nations and, increasingly in developing countries, two of the major causes of deaths amongst young people are suicides and accidents, particularly traffic accidents and drug and alcohol abuse. Clearly, many of them are calling out for help.

Economic and Social Change

Perhaps the most far-reaching influence on patterns of family life has been that of economic and social change that has invariably followed in its wake. Many families, particularly those in rural areas which depend on agriculture for their livelihood, have seen little improvement in their standard of living, the benefits being concentrated primarily in the commercial and industrial sectors and amongst larger landowners and farmers. Also, many rural families have been drawn away from subsistence agriculture into cash-crop production and hence into the money economy.

Education and Employment

For many young people, the biggest difference between their lives and those of their elders is that they belong to the first generation in their family to go to school. In 1960, about 61 per cent of children of primary school age in developing countries and 13 per cent of those of secondary school age were in schools. By 1980 the proportions had increased to 85 per cent and 32 per cent respectively. This is despite the fact that the *number* of children remaining outside the formal education system has also grown due to rapid population growth.

But school attendance does not necessarily mean that effective learning is taking place, nor that the education which the schools are providing is relevant to their students' needs. The nation must work hard to develop educational systems that

focus on basic learning needs, needs concerned with individual survival, self improvement, community betterment and national development.

The content of family life education must be based on the needs of those to whom it is to be imparted. It is vital to ask what are the education needs of young people in their preparation for an adult life that will be as satisfying as possible for themselves and for others with whom they come in contact. What are the issues they are likely to face and what kind of decisions will they have to make? What information do they need? What skills will they need to develop?

ABOUT FAMILY LIFE EDUCATION

Growing up is a natural physical, emotional and social process. All young people reach a stage in their lives, somewhere between the ages of ten and nineteen, when they begin to leave childhood behind. Their bodies change and grow; they begin to look and feel different. They are given new rights and responsibilities and they are expected to behave in a more mature way. They become more aware of themselves as individuals with a personal code of beliefs and values and they learn how to use them in making decisions about the future. They also learn how to get on with others and to cope with the situations that are part of everyday life.

But growing up is not always easy and almost every society has found ways of helping young people through this period of change and development. This is done through an educational process. It is a way of assisting young people in their emotional, physical and social development as they learn to be adults and prepare themselves for important changes in their lives such as marriage, parenthood and work. It helps them to develop the knowledge and skills they need to cope with the challenges of adult life, with personal relationships and belonging to a family and a community.

Young People and Change

Young people's education for family life is traditionally provided informally by members of the family or religious and community elders. From them, young people learn the customs and beliefs of their community, the patterns of behaviour that are approved and the practical knowledge they will need for everyday living. They also learn through watching and listening to other people, by experimenting, making choices and taking risks. They grow up in a world where their lives will probably be

very similar to those of their parents. The family life education which is provided, in whatever form, is largely based on the experience of several generations.

In urban cities and large towns, for many children the experience of growing up is very different from that of children of other areas. Young people are exposed to so many new influences, opportunities and pressures, that many of them have to learn entirely through their own experience how to cope with situations and problems that are unfamiliar to their elders. The family life education that evolved in the past is often inadequate in the present.

Social, political and economic changes have had such a far reaching impact on the lives of ordinary people that many of the traditional systems of family and community organizations are beginning to alter and even break down. In many rural areas, for example, where families have moved from domestic food production into growing crops for sale, money has now become all-important and so, each year, many more young people migrate to the towns in the hope of finding work. Those unable to get jobs may be forced to live in the slums and squatter settlements growing up within sight of the big new buildings. For them, this is a source of loneliness and despair, for which they are often unprepared. Through the mass media and the increased mobility which new transportation systems have made possible, modern youth culture with its fashions and clothes and music has reached beyond the urban centres. Even in the most distant rural areas, few young people remain completely unaffected by it.

Traditional values are increasingly being challenged, often resulting in conflict between adolescents and older people. Many young people have greater personal freedom than their predecessors but they may have less access to family support systems, particularly if they have moved away from home. One of the greatest changes that is taking place in young people's lives is in their attitude towards sexual relationships. At a time when traditional systems of preparation for sexual life and marriage are beginning to break down, adolescents are reaching physical maturity earlier than their parents did. In some societies young people, and especially girls, are still encouraged to marry and start having children at an early age, despite the efforts of governments to raise the minimum age of marriage. Medical evidence has shown clearly that even where early childbearing is socially acceptable, whether within marriage or not, it can endanger the life and health of the mother and her child. At the same time, even though it may increase her status in the family, it invariably restricts her educational, social and economic opportunities.

However, more young people are choosing to marry later, perhaps because they want to stay at school or acquire professional ability for a job. Some are unwilling to

wait until marriage and become sexually active, whether this is acceptable to their families or not. Unwanted early pregnancy is a growing problem in almost every country. Even if there are no medical complications and the young women are not rejected by their families, the consequences for their future lives can be disastrous. Throughout the world, abortion is one of the most widely used methods of fertility regulation. No one knows how many abortions are carried out each year, particularly in those countries where it is illegal; the only measurement is the number of women who die or need hospital treatment as a result of abortions. In India abortion for certain reasons, e.g. contraceptive failure is legal, yet the number of illegal abortions continues to grow.

It is clear that many young women have to go in for abortions because they do not get family planning services or because they fail to recognize the possible consequences of sexual activity. Sexually transmitted diseases (especially gonorrhoea) are becoming more common even in rural areas. This is particularly tragic for young people since sterility is a common consequence for both men and women, if they are not treated in time. Education that encourages young people to make responsible and informed decisions about sexual relationships is urgently needed.

Obviously adolescents are not the only people who have to make difficult choices, deal with personal problems and look forward to an uncertain future. Fortunately, for many of them growing up is a positive period in their lives, when they learn to face the future with confidence. But adolescence today is a time of change — change into the individual and change in the world he or she lives in. It is not easy to cope with both at the same time and many families are clearly finding it difficult to help them. They in turn need the support of youth organizations and other groups which are concerned with the well - being of young people.

Why is Sex Education Important in India?

India is a nation of young people—fifty-eight per cent are below the age of twenty-four years (1986). The years around 15-19 years and 20-24 years are the ones of great emotional upheaval and require careful nurturing. These parents of tomorrow number approximately 150 million (projected figures, 1986). Some are already married, many of them have irresponsibly become parents, some outside marriage. Early marriages are one of the main causes of India's population growth. Despite laws prohibiting girls from marriage before the age of 18 and boys before 21, there are over 10 million child brides in India today. According to the Family Planning Foundation of India, 46 per cent of girls in rural areas are married before the age of

13 and the rest before 17. Tragically, sexually transmitted diseases like gonorrhoea and syphilis, and drug intake, are most prevalent among them. Ignorance, even of their own bodies is widespread.

Young people today may want to seek guidance but they do not know where to get it. Their present attitudes will determine their future growth and even their usefulness as members of society. We have a great stake in preparing them for the responsibilities of marriage and family, particularly today, when many of them are deviating from traditional norms and values.

Understanding Human Sexuality

The very word 'human' in 'Human Sexuality' indicates that our sexuality is different from that of animals, insects, birds etc. In fact, man like the whale, monkey, horse, dog and cat, belongs to the mammalian species which feed their young with milk from the breast.

How do we differ from other mammals?

There are several differences. Man is the only creature which walks on two legs (monkeys do so only occasionally). Human beings look after their young for the longest period known—possibly twenty years or so (even an elephant looks after its young for ten years). He is the only creature which copulates face to face. Finally, and this is the major difference, he is governed by a superior brain which gives him the capacity to think and discriminate. Unfortunately, the human brain does not always think rationally. Fear and anxiety may create many problems including sexual disturbances which are peculiar to humans only.

What is sex, sexual behaviour and sexuality?

Most of us when confronted with the word 'sex' define it as 'doing' something such as sexual intercourse or coitus, or use it in reference to the vagina, penis, orgasm etc. Sex actually indicates only gender that is male or female. Sexual behaviour, on the other hand, indicates the behaviour indulged in to achieve the physical act of sexual intercourse or copulation.

Sexuality means many things to many people. If we ask different persons, their answers would include,—

- a method of procreation;
- a way to reduce tension;

- a form of communication and merging, in which tenderness, mutual concern, love and affection are expressed;
- muscular activity ending in orgasm;
- a means to control and manipulate another person;
- a form of recreation;
- a way to support one's ego;
- a spiritual union;
- an integral part of one's personality affecting all aspects of one's life;
- the expression of one's maleness or femaleness.

So, one can see that sexuality is a complex phenomenon which is difficult to define but perhaps easy to understand.

Certainly, sexuality is and is not sex, or sexual behaviour, or the sex act or sexual intercourse. Sexuality is and is not love and feelings, and is and is not an expression of our sexual selves. In fact, sexuality is all this and more, a fine combination of the physical, emotional, intellectual and social aspects of an individual's personality which expresses maleness or femaleness. Sexuality is seen and expressed in all our daily activities—work, expression of affection, responsible parenthood, childrearing, watching television, etc.

Although sexuality is expressed in many physical ways, it is not seen only in the bedroom as is commonly believed. Another meaning of sexuality is sharing intimacies with another person. It is not confined to sexual intercourse, but includes touching, talking, embracing, fantasizing, kissing, caressing or just holding hands. Sexuality involves a lot of caring and sharing. It is important that people express their sexual selves.

As a parent or teacher responsible for the rearing of a child, it is important to be convinced that the growing children need sex education. However, many parents and teachers, because they are shy, timorous and embarrassed, put off dealing with the issue.

STAGES IN SEXUALITY

Infancy

Infancy (around 16 to 18 months) is the period when emotional and intellectual development takes place and the child's establishment of the basic trust and security

are crucial. Deprived of this affection the person may develop inappropriate sexual behaviour in adolescence and adulthood.

During this time baby boys can have penis erections, a phenomenon which can occur from the moment they are born. Similarly vaginal secretions have been observed in baby girls within 24 hours of birth. Exploration of their bodies and genitals can bring about orgasm. The attitude and behaviour of the parents and others are crucial. Anger and over-reaction towards touching of the genitals may create a permanent negative influence on the young person's feelings about his body and particularly about his genitals. Incidentally, it is a myth that babies who touch their genitals a great deal will be sexually hyperactive when they grow older.

Toddler and Pre-School

During this period children are likely to be fascinated with their own bodies - particularly their genitals. Parents and teachers particularly are confused as to how to respond to this. Very few of them display a relaxed attitude by accepting it as a natural phenomenon and very few use the technique of diverting the young mind to other interesting things which will allow the child to grow more naturally.

Childhood

Children in the age group of four to seven years often ask questions about reproduction and pregnancy or birth, like 'Why is your stomach big Mummy'? 'How did baby get into the stomach'? Answering their questions simply and in a straightforward way is usually the best approach. It is best not to get into very detailed scientific explanations about simple questions. During this stage of development the child generally shows a strong affection towards the parent of the other sex and talks about marrying Papa or Mamma. This is common behaviour during this age.

Touching the genitals increases. No physical harm results from this type of sensual or sexual behaviour. Parents and teachers should act in an accepting manner and take the opportunity to discuss the meaning of private and public acts with their children. Positive feelings and respect for their bodies and those of others by the child ensure that later in life self-destructive acts, or acts that hurt other people, do not occur.

Pre-adolescence and Adolescence

During the age between eight and twelve years, young people experience a period of rapid social development, and an increase of their own sexual selves gathers momentum.

'Best friends' become very important at this stage. Boys form groups of the same age (known as peer groups) while girls have just one or two special friends. Some parents do not accept the normality of this behaviour and often make the young person feel guilty.

Sexual acts like masturbation, homosexuality and heterosexual contact starts at this age. In such a situation it is important that youngsters are made knowledgeable not only about their physical and emotional feelings but are given an opportunity to learn how to make correct decisions regarding sexual matters. Unfortunately, information about sex is not given by the right persons, that is by parents, teachers and health professionals. Recent studies indicate that young people get approximately three-fourths of their sex information from their peers.

Youngsters at this stage of life are happiest in the company of their own kind. Out of this emerges 'the peer group' culture—where likes, dislikes, and values approved by the most adventurous, the most dynamic, the most admired, tend to be accepted by the rest of the group.

Today, professional education for boys as well as girls extends well into the early twenties. The struggle for employment necessitates further delay in marriage. The sex urge, a natural corollary of sex maturation, is at its peak during these very years when youngsters are expected to work single-mindedly for school-leaving and college examinations, and to think of job opportunities and the future. Often they are worried and somewhat ashamed of their own bodies and the new powerful feelings which engulf them, and which they do not understand. It is this pull of divergent forces, the biological and emotional needs in conflict with the social requirements for calm concentration and sustained endeavour, which gives rise to many of the problems of adolescent sex.

ADOLESCENCE

Upto the age of nine to ten years both boys and girls look and sound alike except for the presence of external organs. They then start to develop; the development in boys starts a year or two later than the girls.

Table 9.1 Some physical changes during adolescence

<i>Girls</i>	<i>Boys</i>
Enlargement of breasts	Deepening of voice
Growth of pubic hair	Increase in height
Growth of hair in the armpits	Enlargement of penis
Enlargement of sex organs i.e. vagina (birth passage), uterus (womb), uterine tubes, ovaries, vulva (external genitals)	Enlargement of testicles
Increase in height	Growth of pubic hair
Production of ova	Growth of body hair
Menstruation	Growth of facial hair
Skin problems (Acne can occur)	Erect penis in the mornings
Sex desire starts	Production of sperms
	Acne often occurs
	Sex desire starts

Adolescence is a stage of normal growth when a boy gradually starts growing up to be a man and a girl to be a woman. These years begin between the ages of ten to thirteen years and last till approximately nineteen. The phase of observable and rapid change of adolescence during which boys and girls start to develop the sexual characteristics of adults is termed *puberty*. Puberty is the culmination of the process of sexual maturation, the ability to reproduce. While this maturation may take three or four years from the period of commencement of biological changes, considerable

variation exists. Puberty is a stage of growth which demands much attention, patience and tolerance from parents. For example, communication between adolescents and parents may seem impossible at times. Parents need to regularly discuss with their teenagers the conflict areas which are (a) general freedom; (b) money; (c) inter - personal relationships; (d) religion; and (e) sex.

Many changes take place during this time which are physical, physiological and psychological. The emotional development that runs alongside them will be profoundly affected by the adolescent's social environment. Thus, while there are changes in the body and the development of the sex organs takes place, there are also changes in feelings and attitudes. In fact, while physical maturation occurs rapidly, emotional maturity starts later and goes on until well after full physical growth is achieved.

Hence the period of adolescence, the transition from childhood to adulthood, is usually one of change and confusion (because of rapid transition) both for the adolescent as well as the people around him. However, when marriage occurs during this period, the whole period of adolescence may be missed and the person may fail to establish a sexual and social identity and never get the opportunity to mature. Physically too, there are more maternal and foetal complications in the young adolescent before sixteen years of age.

Emotional Aspirations and Conflicts

During adolescence, growth is rapid, often disorganized and confusing compared to the relatively stable earlier period of childhood. Before the body, mind and feelings co-ordinate once again, adolescents pass through an awkward stage as if some part of the personality were lagging behind. Many of the emotional problems of adolescents are a result of rapid physical changes taking place in them before their feelings have had a chance to catch up with their bodies.

These changes temporarily disrupt self-confidence. Boys and girls require time to get used to the changing body and new body image. They become preoccupied with themselves, their looks and clothes, admiring and worrying about height, weight, body contours, pimples and hair styles. They day-dream and become self-centred, much to the discomfort or annoyance of their parents and other adults.

Through the process of growing up, adolescents make demands on themselves and seek recognition. They develop values and principles in life and also develop attitudes towards people and situations and set goals for themselves.

Adolescents have entered a new world, where they must find who they are and begin to make their own life. There is an inner conflict between the drive for freedom and the need for dependence and security.

At the same time a need to be popular with others in their peer group is one of the problems faced by adolescents because of the basic need to feel accepted and recognized by others. At a time when they are becoming independent of their parents, it is natural to look to friends of both sexes for approval, love and affection.

Adolescence is the time when young people become concerned with their careers, seeking employment and entering new fields. A high rate of unemployment in qualified and unqualified youth not only has an economic impact but also seriously affects the social adaptation and mental health of adolescents.

Tension often develops between parents and children regarding traditional values where the adolescent tends to question and often challenge the older generation. They claim a right to their own judgement and make their own choice regarding clothes, friends etc., and resent adults dictating to them.

Adolescents, like everyone else, aspire for happiness. One needs to understand the phase they are going through.

The Sexual Drive in the Adolescent

A very marked transition from childhood to adolescence is with respect to sexual behaviour. At puberty a strong biological force begins to operate leading to sexual awakening.

After puberty, adolescents may not know why they feel differently about their bodies and about the opposite sex. They may not know about hormones and physical changes, but they know they feel 'different'. Nor do they know that others of their age have the same doubts and anxieties because of which they may often have suspicions about being abnormal. This is a natural part of the process of growing up and eventually achieving independence and maturity.

Sexual urges can be so strong in the male adolescent that he tends to seek sexual gratification at a purely physical level. Sex at this point exists for pleasure and, often, is not associated with emotion or love.

The female adolescent's sexual drive is less at a physical level and she tends, from the earliest awakenings of her sexuality, to associate sex with romantic situations. They dress to attract and seek emotional companionship and look for someone to love. While men in the early part of adolescence learn the mechanics and styles of sex

and in the end learn to combine their sexual concepts with love, the opposite process occurs with women. They begin committed to love and only at the end of adolescence they learn the necessity of regarding themselves as sexual creatures.

Adolescents, at this stage, long for personal relationship with the opposite sex and yet do not seem to know how to go about building them. Cultural attitudes have much to do with this. There is a fear of failure or of being turned away and the insecurity of not knowing how to act. In the end when the sex drive is strong the problem becomes complicated, leaving the girl or the boy uncertain of what to do about their sexual feelings.

When it comes to marriage, there are other conflicts. Social values and beliefs are strong against extra marital sex or love marriages. Going steady is discouraged in our society and till now the selection of a mate has been a family affair, with very little say on the part of the boy or the girl concerned. Some youngsters may desire courtship and dating individually but parents in our society only encourage meeting in groups, which is not palatable to teenagers.

Sex, mainly because of the taboos and restrictions placed on it by Indian society, presents a dilemma to the adolescent. Many adolescents have expressed that sex occupies a large part of their thinking. Society frowns on out-of-marriage heterosexual relationships, prohibits petting and condemns homosexuality.

Adolescents are faced with anxiety about many things and are particularly bewildered by strong sexual urges. They grope for guidance but sadly there is no one they can go to. In many families discussion on sexuality between parents and children is taboo. Only a few schools and colleges offer them family life education. Yet the curiosity of the adolescent about the world in general and sexuality in particular is intense and health aspects of premarital sexuality, adolescent pregnancy, sexually transmitted diseases and abortion are of particular concern to them. Most often information is got through books or friends, and now through television and video.

Communication between the adolescent and the parent is not always easy to establish or maintain. The gap between generations can be narrowed through frank and open dialogue on meaningful issues. The distance between parent and child can be bridged as long as one does not invade the area of privacy of the youngster.

The adolescent needs to be treated as a reasoning, trustworthy person capable of understanding the meaning of sexual behaviour and of evaluating the results of his own actions in terms of his own welfare and that of others.

Some sexual experimentation is likely to become a part of the adolescent's search for his identity as a man, or as a woman. How well youngsters are able to handle themselves during this period may well depend on their inner feelings of self-respect and their sense of work. During these years parents should encourage youngsters and recognize their work so as to help them choose wisely in matters of love and sex. If these emotional needs are not satisfied they may manifest as: (a) anxiety, e.g. tension, imaginary fears; (b) social problems, e.g. juvenile delinquency, crime, eve-teasing; and (c) behavioural problems like aggression, hostility, exaggerated ideas of self, the inability to cope in school, indecision and feelings of something going wrong, and severe disorders requiring psychiatric help.

The nature of the adolescent's relation to his parents and teachers is of fundamental importance. The adolescent is trying to grow up and the function of the parent and teacher is to help him grow up. He should be left to himself, to do things for himself and only be given help at the appropriate time.

Problems of Adolescent Sexuality

Some common anxieties that growing boys and girls have during the period of adolescence (approximately 10-20 years of age) may be divided into; (a) development problems and (b) psycho-social problems.

Development problems

(i) *Variations in attaining pubertal landmarks:* Girls tend to mature approximately 1½ to 2 years earlier than boys. A boy of 15 at the stage when his voice 'breaks' looks and behaves awkwardly, while a girl of the same age may pass for an apparently confident young woman. Boys subjected to ridicule and jeering in co-educational schools suffer deeply and highly sensitive boys may be scared for life. Similarly the girl who does not attain menarche till 15 or 16 differs from the rest of her classmates and experiences acute psychological distress.

(ii) *Menstruation:* The first experience of menstrual bleeding creates fear, even among girls who have been prepared for the event. For those who have been given no guidance, it causes deep-seated worry and anxiety arising from ignorance, superstitious talk and the fear of incurable diseases.

(iii) *Breast development:* The modern girl tends to worry about the size of her breasts which may seem to her to be too small or too large in relation to popular standards of a female's vital statistics.

(iv) *Nocturnal emissions (boys)*: Spontaneous erection and the first involuntary discharge of semen in boys (popularly known as 'wet dreams') generally occur at night when the conscious mind is at rest. This may cause fear and confusion in the adolescent's mind, although it is quite a normal event in the process of growing up.

(v) *Masturbation*: Generally, boys begin to masturbate after they have heard about it from friends or due to the pleasurable sensations associated with unwilling ejaculation, e.g. following friction from light underwear. No physical harm is caused by masturbation. Deep-seated taboos, world-wide, are traceable to early man who ascribed all disease and illness to 'waste of seed' or of procreative power. Thousands of guilt-ridden, misinformed teenagers fear loss of virility, except hair to go grey before its time etc., because they feel that they have 'sinned'. Deep psychological distress of this type can lead to somatic problems such as unexplainable headaches, lassitude and a feeling of general debility.

Psycho-social problems

The strong feelings which arise in the later pubertal phase focus on interpersonal relationships. Adolescents develop an interest in the opposite sex. The yearning for a special person in one's life is heightened by romantic songs, movies and novels. Boys and girls meet each other and sometimes relationships become more serious, whether the pair will meet openly or on the quiet will depend chiefly on the social settings to which they belong.

i) *Pre-marital sex*: Greater mobility, greater anonymity, greater tolerance of violation of mores, the peer-group culture (heavily influenced by films) and a decline of parental authority are some of the factors that have led to a greater incidence of pre-marital sex.

Boys are eager for physical sex; they look upon performance as a proof of virility and many male adolescents are unaware or unconcerned about the consequences of such relationships to the girl.

Girls who are brought up strictly tend to be more cautious. The majority of adolescent girls who indulge in pre-marital sex do so because they have been persuaded by their boy-friends to 'prove their love' or out of fear that their boy-friends may leave them, rather than because of the sexual urge. Some do so to assert their freedom, or out of sheer defiance.

(ii) *Teenage pregnancy and teenage abortions*: One of the dangers of pre-marital sex is pregnancy which poses a serious health hazard – physically and emotionally.

The teenage mother is neither physically mature to nurture a child, nor emotionally ready for the responsibilities of parenthood.

Although Medical Termination of Pregnancy Act of 1972 makes it easy to secure an abortion by a qualified medical person, ignorance and the social stigma attached to being an unwed mother often drives women to quacks at considerable risk to their own lives.

(iii) *Sexually transmitted diseases, smoking, drugs, alcohol:* Adolescents do not have proper knowledge of the consequences of promiscuous sex and often contract sexually transmitted diseases, which they may not detect in the early stages due to lack of guidance. The strong need to be like the peer group, 'to belong', leads most adolescents to their first experimentation with cigarettes, drugs and alcohol.

(iv) *Disinterest in studies:* One of the most acute adolescent problems is the flagging interest in school work. This is more so in boys than girls, because by the age of 15, due to earlier pubertal start, girls have already come to terms with their body changes. Boys at that stage are going through the peak period of the change when emotions are turbulent and body needs are strong.

Counselling the Adolescent

The need for counselling and what it is

The world of the adolescent is characterized by rapid change—biologically, psychologically, and socially. The adolescent undergoes changes in beliefs and attitudes, experiences sexual desires and an identity crisis, desires independence, and searches for more meaningful roles in society. Many go through this time smoothly, others suffer a traumatic period. Whatever be the case, advice, guidance and just being there when required, on the part of parents, teachers, health professionals (e.g. doctors and social workers) are valued by the adolescent at this critical growing-up phase.

The problem in India is that education has still not reached a large majority of adolescents. Hence they are ignorant of sexuality and their responsibility whether they are in the formal school and college settings or in the out-of-school setting—uneducated, unemployed or employed.

Educationists could use three approaches to meet the needs of young people: (1) the promotion of the participation and involvement of the young people in programmes and to act as community group leaders to promote sexual health; (2) making available information, education programmes and learning opportunities

to young people; and (3) providing services for counselling in schools and colleges and at convenient locations around the places where young people work.

Reaching adolescents means more than just contacting them or getting them together in a room. It means getting the point across, affecting their behaviour, being helpful to them and promoting their social development. Counselling is the major answer to most of the psycho-sexual problems troubling adolescents. Counselling for the every-day simple problems can be undertaken by teachers, parents and others concerned, provided they have the aptitude, knowledge and patience to undertake it.

Simple knowledge of the genital reproductive system, should be imparted to all in-school and out-of-school adolescents. Such knowledge will enable the young male or female to:

- * observe essential genital hygiene;
- * learn the facts of human sexuality;
- * cope with physical and emotional changes;
- * develop a wholesome attitude towards sex;
- * dispel from their minds myths and taboos about sexuality;
- * lay the foundation for a satisfying sexual relationship;
- * take good care of their bodies and protect themselves from sexually transmitted and other diseases;
- * be responsible parents and members of the community; and
- * make the correct choices in life.

Evidence all over the world indicates that sex education does a lot more good than harm—promiscuity is not a result of education; rather the person gains maturity.

If an adolescent approaches the counsellor with a problem, he should reduce the anxiety, permit the person to release emotions leisurely in a situation where he or she does not feel that a judgement is being delivered. The adolescent should realise that various helpful options are being put forward which would enable him to make a decision for himself.

There is no magic formula; one need not be highly skilled or brilliant in order to be an effective counsellor. It is the ability to work with the adolescent to suggest alternative solutions to his problem, and above all, to be caring.

Good Counselling

Counselling can consist of six parts described by the word

G A T H E R

- G = GREET in a friendly and helpful way
- A = ASK regarding the problem
- T = TELL the various options opened to the person
- H = HELP the adolescent to understand and clear misconceptions
- E = EXPLAIN in detail
- R = RETURN—the option for the adolescent to visit again should be left open

According to one definition, counselling is a 'warm relationship in which the counsellor fully and completely, without any ifs and buts, accepts the client as a worthy person'.

The role of counsellors or teachers speaking to adolescents is to give them insight and courage so that they may find a solution to their problems by themselves. People seeking help with problems usually go to a person whom they feel they can most readily talk to; and in schools this is the teacher or counsellor.

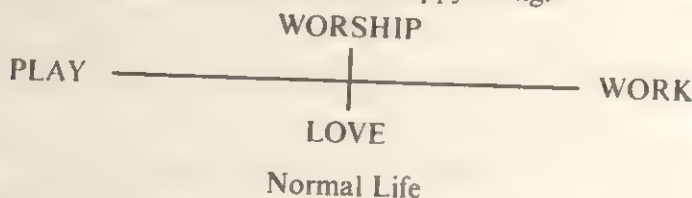
Counselling tries to change wrong attitudes, helps to improve interpersonal relationships, brings about responsibility in sexual behaviour and making choices in sexual situations, prepares the adolescent for responsible parenthood. It is a face-to-face communication in which one person helps another make decisions and act on them.

Handling problems

The way in which young people's feelings and expressions are handled by parents or other key persons (like teachers and doctors) has an immense impact upon their adult lives. One of the ways to influence a young person's attitudes is to clarify the components of love. Another is to give clear specific answers to their questions.

Basis for Counselling — Love

Love, including sexual love, fits closely into the concept of *normal life* and forms one of the four limbs of the *PEUS* of happy living.



Love has been dissected into four constituent parts to describe it: *Labour* — to love one has to work at maintaining a relationship; *Responsibility* to the partner, to the spouse and to the society; *Respect* - to refrain from the exploitation of others; and *Understanding* - to put oneself in the other person's shoes (that is to experience what the other person is actually feeling).

Some Questions Teenagers Ask

Physical changes which occur in the process of growing-up often bring bewilderment and anxiety to young people. Many questions trouble the young mind and require clear, concise and confident answers. Examples of some common questions (abstracted from *Teenagers Ask, Doctor Answers*) are answered below:

Q.1: Why don't my parents understand me any more? They are always nagging me.

A. 1: Yours is not an exceptional problem. Almost all teenagers undergo a phase similar to the one you are experiencing. It is unfortunate that most parents find it difficult to change and, like their parents before them, tend often to be over-assertive and autocratic. However, you must try to understand that they may have a point of view just as you have. Their thinking is naturally influenced by the rigorous modes of behaviour instilled into them during their own childhood. In turn, youth at this age tend to overdo things and it is possible that the manner in which they behave is opposite to the normally prevailing manner.

A family can reach amicable solutions by trying to understand one another's attitudes. It is difficult for your parents to accept that their child who had hitherto led a sheltered life and readily accepted their guidance, now demands independence

and wants to appear grown-up in the choice of friends and way of dress; the expression of opinions may seem to them to be highly critical of people and ideas.

You can play an important part in creating understanding by showing them that you can be trusted fully. You may thus convince your parents of your sincerity and help them to become more tolerant and better able to understand the difficulties you are experiencing in this growing-up period. Talking things over helps to reduce friction within the family.

Q. 2: My voice breaks, my friends tease me about the hair on my chin and what is most embarrassing is that I get erections when I see a girl at the bus stop. I am feeling desperate. What shall I do? I feel a lot of things have gone wrong with me.

A.2: The breaking of your voice and the stiffening of the penis or erection is quite natural at your age. When a person is excited sexually, extra blood flows into the penis, causing it to become stiff. It is true that male babies and young boys get erections for reasons other than sex, but in adolescents and adults, it is normally due to sexual excitement; nevertheless, even until quite late in life, a man may wake up in the morning with an erection for no reason at all. These are natural happenings and beyond your control. The occurrence varies from person to person and is as normal as being tall or short. The variations occur due to individual attitude and interest in sex. You can thus see that there is no need to worry or to consider your involuntary reactions as being abnormal.

Since it is desirable to sublimate sexual energy till such time as you can marry, it would do you a lot of good to indulge in healthy outdoor games, group discussions and community activity, where boys and girls work together for a good cause. Developing the right attitude towards girls is important, as this kind of attitude will reflect in your behaviour.

Q. 3 (a): My breasts are small and flat and I look more like a boy. How can I develop a good bust?

A.3 (a): It is very unfortunate that mass media have created such a fetish about the female breast which is primarily meant to suckle the new-born infant.

The breast is made up of glands and fatty tissues. Since adipose tissue (fat) determines the size of the breast, you can deduce that one way of enlarging your breasts may be to put on more weight. Should underweight be your problem, have a doctor examine you to determine the cause and take his or her advice with regard to treatment. In general, proteins and foods rich in carbohydrates help. Exercises, such as push-ups, develop the pectoral muscles that lie below the breasts.

Creams of sex hormones — oestrogen — have been massaged into the breast but without much success. Plastic surgery or silicone injections are not recommended as they leave the breasts very hard and stone-like. Sex hormones judiciously prescribed by an expert may be of some help, but it is wiser not to interfere with nature.

As far as you are concerned, I would advise you a rich diet; an iron and vitamin tonic to stimulate appetite; and an active outdoor life. Meanwhile, if you feel too self-conscious about your figure, wear a well-padded wired bra. Above all, remember that a healthy body and a sparkling mind are far more attractive than the most perfect of vital statistics!

Q.3(b): My breasts are well developed. Could you advise me as to how I should look after them? I am 16 years old.

A.3(b): I recommend that you wear a well-fitted brassiere. This will support your breasts, apart from enhancing their appearance. Investing in a good brassiere also prevents breasts from sagging later on!

The general rule of good health, such as a balanced diet, a daily bath and suitable exercise should be observed. Since you are only 16, your body will become more shapely in the next few years with the dissipation of puppy fat.

Another good life-long habit to develop is to self-examine your breasts daily, say at bath-time. This will help you to detect any lump or abnormality the moment it appears. Reporting this to the doctor will make him take immediate action if he feels he needs to rule out cancer of the breast. Early treatment rules out the grave dangers arising from neglect.

Q.4: What do you mean by the term 'a virgin'?

A.4: By definition, a virgin is a girl whose hymen is intact. The hymen is a fleshy, thin membrane which partially closes the mouth of the vagina. The closure is not complete and as a rule a finger can be introduced through the opening without breaking the hymen. When the girl first has sexual intercourse, the hymen is stretched and ruptures and this is accompanied by some discomfort and bleeding. As the shape, texture and size of the opening differ considerably in different women, the extent of discomfort and bleeding will vary.

However, there are cases where even in a virgin the hymen is not intact, and it may be so stretchable that it may not bleed at all even at the first intercourse. In other cases, the hymen can be ruptured by operations, injury or masturbation.

Q.5: What is masturbation?

A.5: Masturbation generally means the stimulation of the sex organs to secure pleasure. Both boys and girls may indulge in it. Even small babies handle their own sex organs. This is simply part of the normal process by which they explore and learn about their own bodies. Although the sensation is pleasureable, it cannot be called sexual at this stage.

Around 12 to 14 years of age, the body undergoes changes which prepare it for eventual sexual intercourse. This stage is called puberty. Erection of the penis may occur without any cause and the penis being very sensitive any rubbing, for example against the bed clothes, gives pleasure. If stroked with the hand, the pleasure is intense and may result in ejaculation. If a boy is ignorant of these facts he may get very worried. It is at this stage that he may fall into the trap of newspaper advertisements of Hakims, Vaidyas or unscrupulous doctors.

Of course, any silly superstitions he has heard are all nonsense. This is a perfectly ordinary part of growing up. There is no reason to feel guilty when you have fantasies or day dreams of fantastic sexual adventures—this is also perfectly normal behaviour. No physical harm results even if a boy masturbates frequently over a period of time.

You might consider masturbation to be a sort of imitation of real intercourse. The big and real difference is that it is entirely self-centred while real love-making is very much a shared experience, a means of expressing mutual love, and a giving as well as taking of pleasure and emotional satisfaction.

Q.6: What is menstruation?

A.6: Menstruation occurs monthly in a girl or woman in the child-bearing age. It is also referred to as having 'periods'. About two weeks before a girl menstruates, an egg cell matures inside her in one of the ovaries. The egg travels through an internal tube (fallopian tube) to the womb or uterus. Under the influence of special sex hormones, the internal lining of the uterus becomes velvety in appearance due to an increase in blood vessels and tissue.

If the woman has had intercourse and the ovum or egg has been fertilized in the tube by the male sperm, the fertilized egg moves into the tube where it is nourished by the rich tissues of the uterus. If not, the lining of the uterus is not needed and is gradually released during menstruation which lasts for a period of four to six days.

During this period some girls feel low, unstable and moody. This is due to changes in the body chemistry. With the onset of the menstrual flow, the tension wears off. Menstruation is a proof that you are perfectly normal and healthy.

Q. 7: My friends tell me that my period should be regular and come at the interval of every 30 days. Mine comes sometimes and sometimes are delayed for 6-7 weeks. I am worried. Is there anything wrong?

A. 7: In the early stage of menstruation, which begins around 11-14 years, the hormones from the pituitary gland fluctuate and so do the responses of the hormones secreted by the ovary.

In young girls this fluctuation is manifested by delayed or too frequent periods. By 16-17 years of age, the menstrual cycle should have stabilized. Again, before cessation of menstruation, i.e. menopause, a similar disturbance becomes evident due to the waning of hormones around 43-45 years of age.

However, if your irregularity persists beyond 16 years of age, it would be wise to see a gynaecologist to check for other factors.

Also, the menstrual cycle varies in different women. Some have a 30-day cycle, others have one of 27 or 28 days and still others may only menstruate at the interval of every 35 days.

It is the consistency of a cycle that determines regularity and not the number of days between periods. In actuality, large numbers of women never achieve a regular cycle. Even those who do, may suddenly become irregular for a time—due to shock, overwork or emotional stress.

REFERENCES

- Burt and Meeks, *Towards a Healthy Sexuality*, W.B. Saunders Company.
- Carrera, Michael, *Sex the Facts the Acts and your Feelings*, Crown Publishers, New York.
- Danish Family Planning Association, *Adolescent Sexuality: Knowledge, Attitude, Behaviour*.
- Family Planning Association of India, *Sexuality and the Mentally Handicapped-A Manual for Parents and Teachers*.
- Fonseca, Mabel, *Sex and the Teenager*.
- Goldwald, W.H. and G.H. Golden, *Sexuality: the Human Experience*.
- Harwatz, M.G. and M.A. Novak, *Human Sexuality*, Harper & Row Publishers, New York.
- International Planned Parenthood Federation, *Growing up in a Changing World, Part I & Part II*.
- Mascarenhas, M.M., *Family Life Education-Value Education*, Crest, Bangalore.
- Mukhi, Sarla, *Problems in Adolescent Sexuality*.
- Watsa, M.C., *Teenager Asks and Doctor Answers*.

Human Reproduction

R. N. GUPTA

INTRODUCTION

In India, sex education is yet to be valued socially. Both parents and teachers are hesitant and reluctant to provide adolescents with sex education. This attitude prevents adolescents from acquiring a proper understanding of sexuality, of their responsibilities as growing individuals, and of ways to know and communicate with the opposite sex. Boys and girls lack the requisite knowledge about their own body, sex organs and their functions. During puberty, when physical, physiological and psychological changes occur in them, the adolescents develop emotional and other psychological problems. When they enter the phase of transition from childhood to adulthood, changes occur not only in their body and particularly in their sex organs, but also in their feelings towards opposite sex. A proper knowledge and counselling about this stage therefore may equip them with coping skills, and help them to best adjust in life and live successfully in society.

In view of the above, the present chapter aims to provide insights into (i) the physiology of human reproduction, (ii) fertility regulation, and (iii) sexually transmitted diseases, including AIDS. The overall objective of the description of these three aspects is to assist teachers in preparing adolescents with adequate knowledge and values about their own bodies for dignified and responsible interaction with opposite sex, for a healthy and better married life and for responsible parenthood.

REPRODUCTION

Though reproduction is simply a physiological phenomenon, its significance to human beings is considerable. The continued process of reproduction has institutionalized itself under the most significant social institution, the family. It is in a family as a unit of the larger society, that males and females are given the social sanction through marriage to live together, establish a sexual relationship and procreate. It is true that there are instances of couples living together, having sexual relationship and procreating without entering into wedlock, particularly in the

western countries, but such cases tend to generate complex social implications. The human reproduction thus has critical sociological and psychological ramifications. It is influenced by socio-cultural and behavioural factors and has significant socio-economic and even political implications. To understand human reproduction, the knowledge of male and female reproductive systems is essential. Males and females have different reproductive organs. These are listed in the next section, and male and female reproductive physiology is described.

Physiology of Human Reproduction

Male Reproductive physiology

A knowledge of the male reproductive parts¹ and system will help in understanding the male reproductive physiology. Together with the definition² of each of these parts, Figure. 10.1 will make learning simpler.

Testes:	A pair of male gonads or sex glands (organs in which reproductive cells are produced) located in the scrotum, that produce sperms and hormones, also known as testicles.
Penis:	The external male reproductive organ through which semen and urine pass.
Scrotum:	The sac, a wrinkled-looking pouch, below the penis that contains the testes.
Urethra:	A tube that carries urine and semen from the bladder through the penis to the outside of the body.
Vas deferens:	A pair of tubes between the testes and the prostate gland that serve both as a storage area and as a passageway for sperms.
Seminal vesicles:	Two sac-like male reproductive glands that produce seminal fluid, a component of semen. They are located behind the prostate gland and are attached to the vas deferens.
Prostate gland:	A male reproductive gland that provides most of the semen. The prostate gland surrounds the lower part of the bladder and the upper urethra.
Cowper's gland:	Two glands located near the prostate gland, that produce a small amount of clear, sticky fluid. This is released into the urethra prior to ejaculation. The fluid changes the environment of the urethra to enable sperms to remain alive as they pass through it.

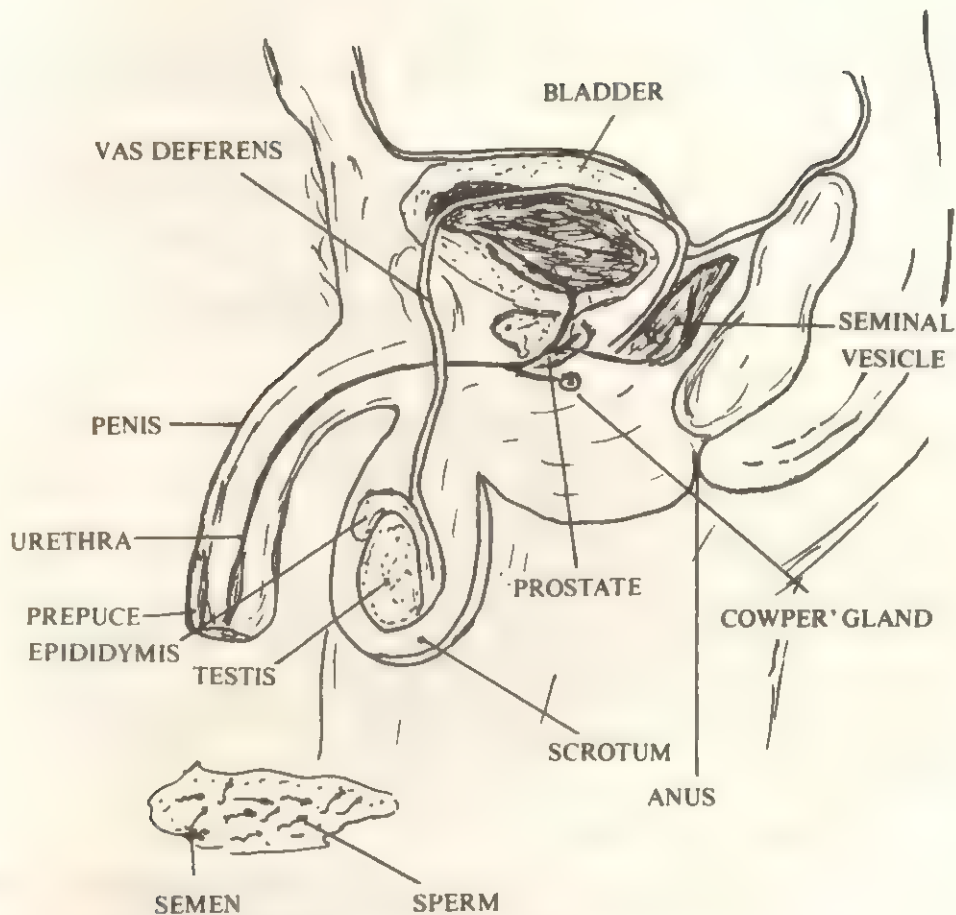


FIG. 10.1 MALE REPRODUCTIVE SYSTEM

Semen:	The whitish fluid ejaculated from the penis. Semen consists primarily of liquid from the prostate gland and from the seminal vesicles, and normally contains sperms.
Sperms:	The male reproductive cells made in the testes.
Epididymis:	The beginning of the sperm duct which is attached to the testes. Sperms are stored, matured and transported in the epididymis.
Testosterone:	The primary male hormone produced mainly by the testes. It influences the process of male sexual development, male sexual characteristics and reproductive organs (not shown in Fig. 10.1).
Androgens:	The hormones that produce masculine sex characteristics (not shown in Fig. 10.1).

When boys and girls first establish or experience their genital maturity and ability to produce off-springs, it marks the onset of a period known as puberty. During this period, besides emergence of secondary sex characteristics like the growth of body-hair in males, the testes mature and produce sperms. In females, there is a growth of pubic hair and breasts, and there starts menstruation and ovulation. During the sexual intercourse, man ejaculates semen in the vagina of the female. The semen contains several millions of sperms, but only the strongest one of them reaches the reproductive tract of the female and fertilizes the (female) ovum. The life-span of sperm is 24-120 hours as compared to the life-span of an ovum which is 12-24 hours. The fertilization of the ovum depends on the type of response of the female reproductive physiology.

Female reproductive physiology

The female reproductive organs³ is illustrated in Figure 10.2. The definitions⁴ will prove useful in understanding female reproductive physiology.

Vulva:	The external reproductive organ of the female, including all the parts that constitute the female external genitalia.
Monspubis:	The soft, fatty pad of tissue located over the pubic bones in front of the lower part of the pelvic cavity.
Labia:	The folds of skin that form the inner lips (<i>labia minora</i>) and outer lips (<i>labia mojora</i>) on both sides of the vaginal opening.

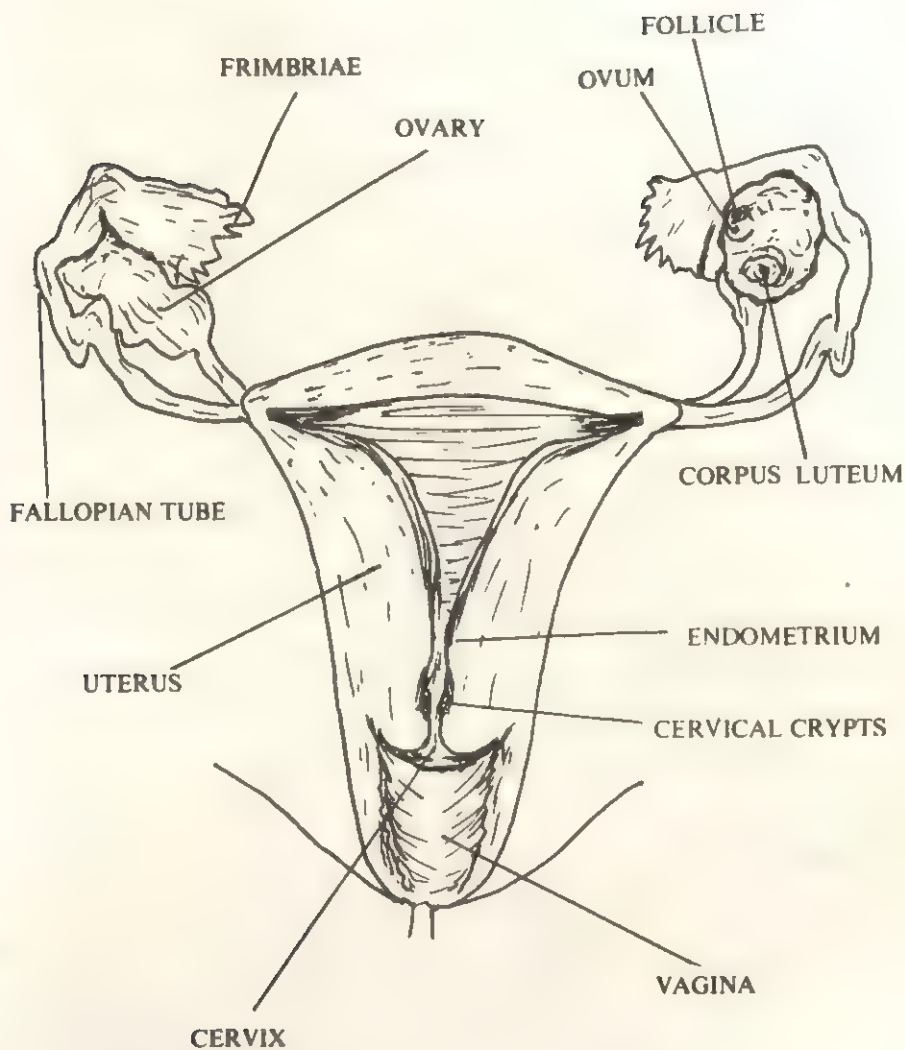


FIG. 10.2 (a) FEMALE REPRODUCTIVE SYSTEM

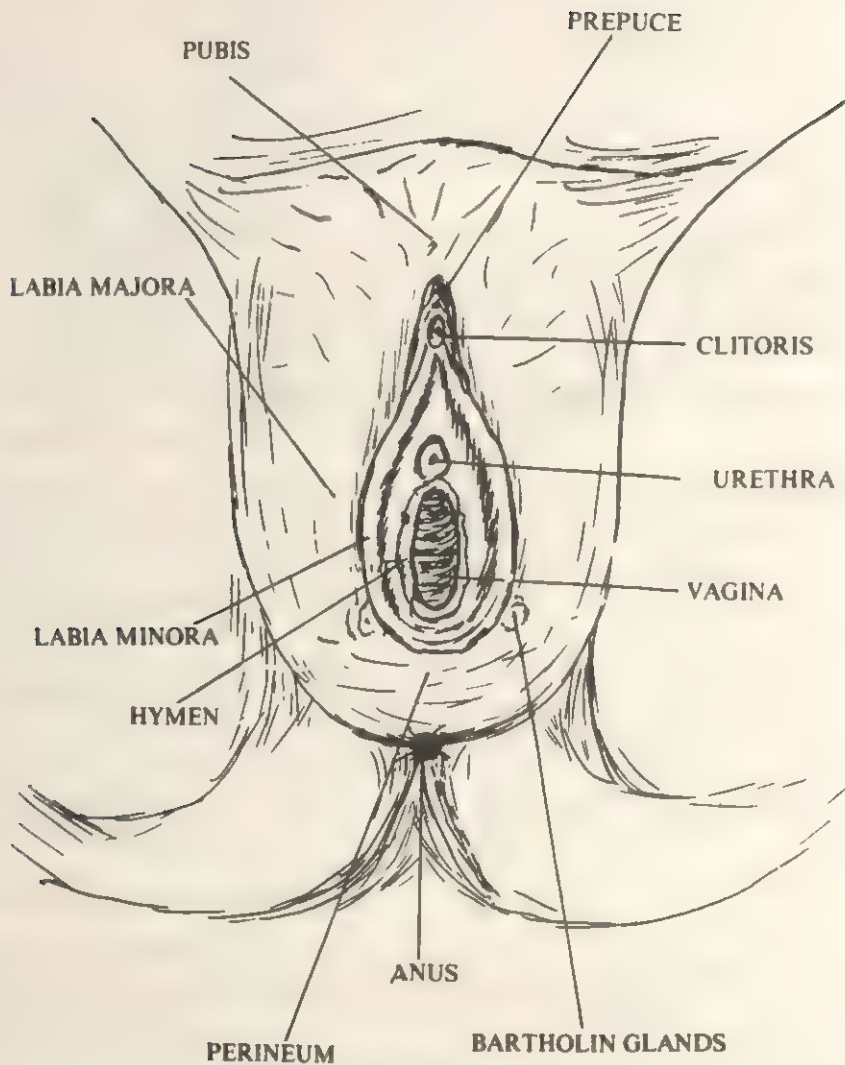


FIG. 10.2 (b) FEMALE REPRODUCTIVE SYSTEM

Clitoris:	A sensitive external organ located just above the urinary opening (urethra).
Urethra:	The tube that carries urine from the bladder to the outside of a woman's body.
Vagina:	The stretchable canal extending from the vulva to the cervix.
Hymen:	A thin membrane that partially covers the entrance to the vagina.
Cervix:	The narrow bottom part or neck of the uterus located in the back of the vagina.
Uterus:	The muscular reproductive organ located in the pelvic cavity between the vagina and the fallopian tubes.
Endometrium:	The inner lining of the uterus composed mostly of functioning tissue, mucus and blood. It develops during each menstrual cycle in response to female sex hormones.
Fallopian tubes:	Two tubes that extend toward the ovaries from the upper sides of the uterus.
Ovaries:	The female gonads above the uterus that produce ova and hormones that control female reproduction and are responsible for the development of female secondary sex characteristics.
Egg cells or ova:	The female reproductive cells which are some of the largest cells in the human body.
Estrogen:	The female sex hormone produced mainly by the ovaries (not shown in Fig. 10.2).
Progesterone:	One of the two major female sex hormones, produced primarily by the corpus luteum (not shown in Fig. 10.2).

The role of the female reproductive organs and sex hormones set her reproductive physiology. A woman's puberty or subsequent menstruation is indicative of the maturity and functioning of her different reproductive organs and related physiology. In a normal healthy woman menstruation occurs once in every 28-30 days. Shortly after the start of menstruation, weak structures containing a fluid that contains ovum, start developing in one of the ovaries. At the same time, the level of sex hormones (estrogens) starts increasing. This process occurs a few days before the release of ovum (ovulation) and stimulates the woman's reproductive system, softens the uterus and enables growth of the endometrium and secretion of mucus.

The woman can feel the secretion as well as nature of mucus (wet, lubricative, stretchy and thick and sticky) by touching her vulva. When the hormone level increases, the weak fluid structure (follicles) ruptures and ovum is released. This process, called ovulation, occurs several days before the onset of the next menstruation. As soon as the ovum is released from the follicles in the ovary, it is picked up by the corresponding fallopian tube, and transported to the uterus. If as a result of intercourse, there are already healthy sperms present in the fallopian tube, through which the ovum is travelling towards the uterus, one of them, the strongest one, knocks against the ovum and enters it. Thus, fertilization occurs.

The fertilized ovum, now called the blastocyst, gets attached to the endometrium (uterus lining). This process is called implantation. The woman thus conceives, i.e. becomes pregnant. Now the fertilized ovum grows in the uterus as an embryo till the eighth week and afterwards as a foetus. The foetus receives nourishment from the uterus lining till it is born after nine months from the conception.

Once the fertilization takes place, the woman may gradually start feeling a dryness in her vagina, as the mucus pattern changes from lubricative and stretchy to sticky and thick. She may also feel an increased basal body temperature, due to an increase in the level of the hormone (progesterone) produced by the corpus luteum. She would now miss her menstrual cycles. In case the fertilization does not occur, the increased basal body temperature is sustained only for 10 to 16 days (due to the rise in the hormone levels) and the unfertilized ovum gets destroyed. Subsequently, the position changes. The fall in the hormone levels causes a fall of the endometrium (blood, tissues and mucus). Thus, menstruation starts again.

FERTILITY REGULATION

Fertility regulation, contraception and family planning are the terms used most often. These terms are used interchangeably, and refer to the conscious use of different methods by couples in their reproductive ages in order to avoid or space pregnancies and achieve the desired family size.

In India, two terms 'family planning' and 'family welfare' are very common, but for the convenience of general understanding, we shall henceforth use the term 'family planning'.

Family Planning: A Definition

Family planning is a means of enhancing the quality of families, which includes

regulating and spacing childbirth, helping sub-fertile couples to beget children and providing counselling for parents and would-be parents. Family planning is not only aimed at avoiding child births or having small families, but it is also a way of promoting the welfare of the family. It ensures that every child is a wanted child and protects the health of mother, children and the entire family. By adopting family planning the parents can decide for themselves how many children they want, whether they are capable of supporting them, and when they can have them.

Family Planning Methods

Family planning methods may be classified into the following three groups .

Traditional Methods

The methods which have been used since ages to avoid pregnancy are abstinence, withdrawal, breast-feeding, indigenous preparations, herbs, oil plugs, sponges, douche, etc. These are known as the traditional methods of family planning.

(i) *Abstinence*: When both the husband and the wife refrain from sexual intercourse in order to avoid pregnancy, the method is called abstinence.

Merits

- (a) It is a behavioural device and needs no external aids . The couples decide and practice it.
- (b) It is generally accepted as a healthy way of sexuality.

Demerits

- (a) It needs a very high level of self-motivation and will-power to control the sexual urge.
- (b) It needs a high level of mutual co-operation and understanding between the spouses.
- (c) It is not based on any principle of identification of the risky fertile days and the safe days during the menstrual cycle of the woman.
- (d) The probability of failure is higher with this method, and there are more chances of pregnancy.

(ii) *Withdrawal*: In this method the husband withdraws his penis from the vagina before ejaculation. He ejaculates outside the vagina so that the sperms do not enter

the uterus and the ovum does not get fertilized. This method is also called 'coitus interruptus'.

Merit

This method does not depend on any external support or aid. Its success depends on the initiative and willingness of the husband to withdraw properly before orgasm.

Demerits

- (a) It provides incomplete sexual gratification; as before reaching the peak of sexual excitement (orgasm), the man has to withdraw his penis out of the vagina and ejaculate outside.
 - (b) It needs a high level of precision for withdrawal of the penis from the vagina before ejaculation.
 - (c) It has high failure rate.
- (iii) *Breast feeding*: Exclusive and prolonged breast feeding delays the resumption of ovulation in the mother. Delayed ovulation does not allow pregnancy even if intercourse is performed.

Merits

- (a) Breast feeding has the double advantage, i.e. it delays ovulation and provides nourishment to the child, if practiced exclusively and for a long period.
- (b) It does not inhibit sexual pleasure.

Demerits

- (a) Breast feeding does not definitely delay the return of fertility or ovulation in all women for a long period.
- (b) It is not a dependable method in all women for long, despite continued breast feeding.

Natural Family Planning (NFP) Methods

Natural family planning is a way by which married couples avoid pregnancy by refraining from sexual intercourse during the fertile phase of the women's menstrual cycle, in which the chances of ovulation are high. The principle of NFP is based on the understanding of the fertile and the infertile phases of the menstrual cycle through signs and symptoms of the changes that occur in the cervical mucus and body temperature. There are four ways or methods of practicing NFP.

(i) *Rhythm*: This method is also known as the calendar method. It is based on the calculation of the probable fertile days using at least 6 retrospective menstrual cycles. If 18 to 20 days are subtracted from the shortest menstrual cycle of the woman, the start of the fertile phase is known. To know the last fertile day, 10 to 11 days are subtracted from her longest menstrual cycle.

Merit

It is a non-barrier method.

Demerits

- (a) The method requires a longer period of sexual abstinence.
- (b) It is not easy for every woman to calculate the beginning or end of the fertile phase from their menstrual cycles.
- (c) It is rather difficult to know the peak days of ovulation.
- (d) The method has a high failure rate.

(ii) *Basal body temperature (BBT)*: This method is based on the woman's body temperature which indicates the occurrence of ovulation and the beginning of the infertile period. The woman needs to maintain her body temperature chart by recording her temperature every morning. Her chart would indicate a shift in the temperature from lower (pre-ovulatory) to higher (post-ovulatory), which continues till the next menstruation. However, the shift in the temperature is followed, shortly after 3 days, by an infertile phase.

Merit

This method has more probability of providing protection from pregnancy than the rhythm method has.

Demerits

- (a) The method is not easy to follow for illiterate women.
- (b) It is a cumbersome method.
- (c) It has a high failure rate.

(iii) *Cervical mucus*: This method is also known as Billings or the ovulation method. Dr. John Billings and his wife, Evelyn Billings developed this method of natural

© 2004 Blackwell Publishing Ltd, *Journal of Internal Medicine* 255: 105–112

1992

© 2004 Blackwell Publishing Ltd, *Journal of Internal Medicine* 255: 103–110

1. The first group of people who are not in the labor force are those who are not in the labor force for any reason. This group is the largest and is made up of people who are not in the labor force for any reason.

© 2006 The Authors
Journal compilation © 2006 Blackwell Publishing Ltd

[illegible]

1990-1991 1991-1992

and women. It is possible that the high level of the women's representation in the 1990s was caused by the strong gender equity ideology. The current research is necessary because it could give better picture of the past and future. The author would like to study this.

1

- 1) $\mathcal{C} = \{C_1, \dots, C_n\}$ is a collection of n classes, $n \geq 2$, and $\mathcal{C} \neq \emptyset$.
- 2) \mathcal{C} is a partition of \mathcal{X} , i.e., $\mathcal{C} \cap \mathcal{C}' = \emptyset$ for $\mathcal{C} \neq \mathcal{C}'$ and $\bigcup_{\mathcal{C} \in \mathcal{C}} \mathcal{C} = \mathcal{X}$.
- 3) \mathcal{C} is a σ -algebra, i.e., $\mathcal{C} \in \mathcal{C}$ implies $\mathcal{C}^c \in \mathcal{C}$.

Demerits

- (a) Its failure rate is high.
- (b) There are problems in its disposal after use.
- (c) For each intercourse, a fresh condom is to be used.
- (d) It inhibits sensation or sexual pleasure.

(ii) *Spermicides*: The spermicides are chemical preparations which provide protection against fertilization for about 30 minutes. These immobilize or kill sperms because of the detergent they contain. Vaginal foam, tablets, cream, jellies, suppositories and sponge are spermicidal preparations. These are placed in the vagina before intercourse.

Merit

A women can use it by herself 10 to 30 minutes prior to intercourse.

Demerits

- (a) The failure rate is high.
- (b) Spermicides cause burning sensation.
- (c) Some women develop allergy.

(iii) *Diaphragm*: A diaphragm is a rubber-cap, having a round shape. The edge of this device is made of coiled rim. It is fixed inside the vagina so that it covers the cervix. The spermicide or jelly is used with this device. Thus, the combination of jelly with diaphragm affects the sperms in two ways. First, the diaphragm prevents them from entering into the cervix and second, those sperms which are around are immobilized or killed. The device is of different sizes to suit different women.

Merits

- (a) If trained, a woman can use the device herself conveniently.
- (b) Even though it is a barrier method, it does not inhibit sexual pleasure.

Demerits

- (a) The woman needs to be trained by a doctor or a paramedical personnel for its correct insertion and safe removal.
- (b) Incorrect use or displacement of the device may result in its failure.

(iv) *Intra-uterine devices (IUDs)*: These are of different types. The T-shaped copper IUD (CUT 200 mm²) is a popular device in India. The earlier popular brand was the Lippes loop. Now newer generations of copper, silver, gold and hormonal and plastic IUDs with tails or thread are available. The IUD is inserted into the uterus by the doctor or the trained paramedical personnel. It remains in the uterus for a few years (3-5 years) until automatically expelled or deliberately removed. It prevents implantation of the fertilized ovum on the uterine wall and helps avoid conception.

Merits

- (a) Its efficacy is high as compared to other barrier methods.
- (b) Its duration is long (about 3 to 5 years).
- (c) Once withdrawn, the return of fertility is fast.

Demerits

- (a) It can be inserted only by a trained person or a doctor.
- (b) It has to be removed after 3 years.
- (c) It can cause pain, spotting, bleeding, etc.
- (d) Its migration, perforation of the uterine wall and expulsion are possible complications.

(v) *Oral pills*: The contraceptive pills are called combination pills, as they are made of oestrogen and progestogen which suppress the ovulation. These days, progesterone pill, popularly known as minipill, is also available. In our National Family Welfare Programme, Mala-N (Norethisterone acetate 1.0 mg and ethinyl oestradiol 0.03 mg) and Mala-D (Levonorgestrel 0.5 mg. and ethinyl oestradiol 0.03 mg) are available in packets of 28 tablets (21 contraceptive pills + 7 iron tablets). The pills are to be taken regularly by mouth.

Merits

- (a) The success rate of contraceptive pills is high, if used regularly.
- (b) It is a self-administered method of contraception.
- (c) It is a reversible method.

Demerits

- (a) A woman has to be physically checked up by a doctor before she is advised to take the pill.

- (b) Periodically, she has to be followed up and physically checked-up by a doctor.
- (c) The pill causes physiological and physical discomforts, like spotting, bleeding, pain, weight gain, vomiting, etc.

(vi) *Tubal sterilization*: This method is also called tubal ligation or occlusion by which the woman's fallopian tubes are cut, tied and closed by electrocoagulation, bands, sutures, rings, etc. A simple form of sterilization is called 'laparoscopic', which is done under local anaesthesia with little incision. A simpler technique is known as 'minilaparotomy'. These procedures reduce the duration of stay in the hospital. In a few hours after the sterilization, a women can walk out from the clinic. The methods are permanent, though it is now being claimed that the micro-surgery can reconnect the tubes.

(vii) *Vasectomy*: The method involves cutting and tying of the vas deferens of the man under local anaesthesia. This restricts ejaculation of semen carrying sperms. The procedure is simple and permanent.

Merits

- (a) The sterilization of both male and females are simple and permanent methods.
- (b) The efficacy of these methods is high.

Demerits

- (a) The reversibility of these procedures is difficult, costly and less successful.
- (b) Pain and weakness in both women and men and swelling around the site of incision in men are reported as temporary side-effects.

SEXUALLY TRANSMITTED DISEASES

Sexually transmitted diseases (STDs) and venereal diseases (VDs) are the terms used interchangeably. The purpose of this section is to provide basic information about the STDs and their symptoms in order to enable us to understand the seriousness caused by them.

STDs: The diseases transmitted through sex relations or sexual intercourse are known as sexually transmitted diseases. The main STDs are mentioned below:

(i) *Gonorrhea*: It is caused by a gonococci (bacteria) which penetrates the cells found in the cervix, urethra, rectum, the lining of the cyclydi, the throat and vagina of young girls.⁵

Gonorrhea is a dangerous STD which can cause sterility, arthritis and heart disease in men and women. It can also cause pelvic inflammatory disease (PID) and irregular menses in women. Generally, people suffering from this disease do not show symptoms. But the most common complaints are pain in abdomen, and burning sensation while passing urine. Discharge from penis and sore throat are also reported. The disease can pass from a pregnant mother to her newborn child.

(ii) *Syphilis*: Syphilis is caused by a spiral shaped organism called treponema pallidum⁶. It is more dangerous than gonorrhea. It spreads in four stages. The first stage causes sore or chancre on sex organs, cervix, lips, fingers, inside the vagina, anus and mouth. In its second stage, i.e. within 6 months, the circulatory system is affected. The stage is identified with symptoms like rashes on hand palms and feet soles, pain in body joints, hair loss, etc. In the third stage, the symptoms disappear but the stage lasts for a longer period, e.g. 3-12 years and heart and brain are infected. In the fourth stage, blindness, insanity, heart disease, etc. may occur. Unlike gonorrhea, it can cause death also.

(iii) *Herpes Simples Type II*: Herpes II is a viral infection related to Herpes I which causes the common cold sore⁷. It occurs below the waist and affects sex and other organs. Sore or blisters occur on the thighs, penis, near anus and inside the vagina. An infected mother can pass on the disease to her newborn baby.

(iv) *AIDS*: The acquired immune deficiency syndrome is caused by a virus called human immunodeficiency virus (HIV). HIV damages the body's immune system, leaving it unable to fight off infections and cancers⁸. It is a fatal disease. So far there is no treatment for AIDS; once it occurs, the patient is doomed to die. One may develop AIDS but the symptoms may not necessarily appear soon. It may take several years for the symptoms to get manifested. A person exposed to AIDS may develop fatigue, weakness, fever, weight loss, cough, etc. Besides sexual intercourse with different partners, exchange of body fluids and transfusion of blood, infected hypodermic needles, etc. can also cause AIDS in a normal person. A mother with AIDS can infect her newborn baby.

Prevention of STDs

In order to avoid STDs, one should abstain from sexual intercourse with unknown and many partners. Homosexuality and oral sex should also be avoided. In

circumstances where abstinence is not practiced, condoms should be used. Before and after sexual intercourse sex organs should be washed with soap. On seeing any symptom of STDs or developing doubt of the disease, doctor should be consulted.

The best measure to prevention of STDs is education to adolescents, men and women for self restraint and change in such sexual behaviour that leads to STD.

REFERENCES

1. UNESCO, Sex Education—Part Two, Bangkok, UNESCO Principal Regional Office for Asia and the Pacific, 1988, p. 15.
2. Institute for International Studies in NFP, *Glossary of Natural Family Planning Terms*, Washington DC, Georgetown University, August, 1988, pp. 14-15.
3. Unesco, *Sex Education*, *op. cit.*
4. Institute for International Studies in NFP, *op. cit.*, pp. 8-10.
5. UNSECO, *Sex Education*, *op. cit.*, pp. 200-201
6. *Ibid*
7. UNSECO, *Sex Education*, *op. cit.*, pp. 200-201
8. *Ibid*

SELECTED REFERENCES

1. UNSECO, *Sex Education: Package Two*, UNESCO Principal Regional Office for Asia and the Pacific, Bangkok, 1988.
2. Garcia, Rosalia Rodriguez, et al., *Glossary of Natural Family Planning Terms*, Institute for International Studies in Natural Family Planning, Georgetown University, Washington D.C., 1988.
3. Government of India, *Product Brief: Social Marketing Programme for Oral Pill*, Ministry of Health and Family Welfare, Department of Family Welfare, New Delhi.
4. Ory, Howard W., et al., *Making Choices: Evaluating the Health Risks and Benefits of Birth Control Methods*, The Alan Guttmacher Institute, New York, 1983.
5. *International Family Planning Perspectives*, Vol. 13, 3 September 1987, The Alan Guttmacher Institute, New York.
6. *Population Reports, AIDS Education - A Beginning*, Population Reports, Series L, 13 September 1989, The Johns Hopkins University, Baltimore, Maryland, USA.
7. UNESCO, *Family Life Education, Package One*, UNESCO Principal Regional Office for Asia and the Pacific, Bangkok, 1988.
8. Krishnamurthy, G.B. and Thiagrajan, S., *A Programme Guide to a Happy Family*, USAID, Health and F.P. Division, New Delhi 1967.
9. *Population Reports, Periodic Abstinence*, Series I, 3 Sept. 1981. The Johns Hopkins University Baltimore, Maryland, USA.
10. Government of India, *Family Planning Programme Series I*, 24 March 1984.
11. Gupta, Sushma, et al., *Improved Utilization of Oral Contraceptives: A Guidebook for Doctors*, Indian Council of Medical Research, New Delhi, 1989.



SECTION - VII
EDUCATIONAL DEVELOPMENT

Population Change and Education in India

A.S. SEETHARAMU

EDUCATION AND QUALITY OF LIFE

The legitimacy of a nation-state is judged on the basis of its efforts to fulfil the needs and aspirations of its people and thus raise their quality of life. Its credibility is determined by the results achieved in various spheres of social, economic and political life in general and specifically in terms of the satisfaction of basic needs at the micro-levels. Whether one calls it the Physical Quality of Life Index (PQLI), or the Basic Needs Framework (World Bank usage), or Minimum Needs Programme (MNP, V Five Year Plan) or by any other phrase, it is clear that the provision of a basic, minimum quantum of knowledge and skills as well as the development of a healthy and desirable set of attitudes, appreciations and values is a *sine qua non* of development of a nation. It is a fundamental human right as well as a societal and national duty. UNESCO has recognized this human right at the international level by its mandate on Universalization of Primary Education and Literacy for all on this planet. Thus it is observed that levels of education attained by the people of a nation is an integral indicator of the quality of life therein. This level of education should contribute through its quality to the development of a free thinking, fearless, creative, reflective and responsible human being who is free from want, and sufferings and is also concerned with the creation of an equal and just society. In essence, it is the basic quality of the individual human beings that constitutes the quality of life of the people of a nation as a whole. It is, therefore, on the basis of this criterion, i.e. the quality of life that it provides for its citizens, that the performance of India as a nation-state must be judged.

This chapter is confined to a critical examination of the efforts by the Indian nation-state with regard to only one significant component of quality of life, namely, the provision of educational facilities to its people over the past 40 years since independence. It seeks to review the progress made in respect of certain predetermined national objectives, reflecting national needs and aspirations such as universalization of primary education, elimination of illiteracy, equalization of educational opportunities between social classes, groups and sexes, offsetting imbalances among regions in the provision of educational services, etc. The analysis of educational growth and development in India is attempted in the context of

population change over the period of forty years. Pointers to the future and the needed correctives are proposed in the light of trends experienced so far.

NEED FOR POPULATION STUDIES IN AN ANALYSIS OF EDUCATIONAL GROWTH AND QUALITY OF LIFE

Planning may be broadly defined as balancing resources with needs to achieve set objectives and goals. There are limits to the resources available to a nation for the realization of its objectives and goals. The resources, on which there are limits, are of two types: physical and human. The land mass of the nation which includes the area available for agriculture, forests, mineral resources, oil and petroleum products, cattle wealth etc., and sea-based resources including oil and fishery, are physical resources. The number of people available for work, the levels of literacy and other skills attained by these people for various types of work and specializations therein, are the forms of human resources. The levels of technology attained by the nation and in particular its spread among the populace is also a form of human resource.

Most of these resources are time-specific and changing while some of them like mineral wealth, cultivable land, and sea-wealth are limited and relatively static over a period of time. The revenue received from these sources are used to meet a number of needs in such ways as to realize certain set objectives and goals. In the Indian context the objectives and goals are defined in various official documents, such as the constitution and the five year plans. The needs of the nation are defined by the number and variety of people therein.

When education is considered as an indicator of the quality of life and when a minimum quantum of education for all is set as a goal of national life then the magnitude and dimensions of the need depend upon the number and quality of the people therein. Scientific and rational attempts for a planned national life are on the one hand limited by the availability of resources and on the other constrained by the changes in the size and quality of the population whose needs are to be commensurate with these resources. Hence, it is essential to understand the trends in population growth and its eventual impact on the provision of facilities and services in education. Such understanding will provide alarming signals for future exercises in population policies and educational planning efforts.

In fact, the well known economist Cannon had propounded a theory that every nation should maintain a balance between the size of its population, its birth rate and the available natural resources. This theory is known as the 'Optimum Theory of Population'. However this theory was contended by Ansely J. Coale and Edgar

M. Hoover.¹ They did not agree that resources are as limited as generally assumed. Technology is an intervening variable in the exploitation of available resources. In simple terms, it is observed that with the use of modern or scientific methods of agriculture, development of irrigation facilities and assured water supply, rotation of crops, multiple-cropping, etc., the land which is a fixed asset, may be made more and more productive. These arguments do not mean that unchecked population growth will have no effect on the environment or natural resources or plan efforts. It should be interpreted as an argument to avoid panic and instill hope and confidence.

EDUCATIONAL POLICY IN INDIA

The Constitution of India is by far the single most important document from which one can understand the elements of an educational policy in India. There are two major commitments which have provided the framework for an educational policy. They are the fundamental rights and the directive principles of state policy. They are called the 'Conscience of the Constitution'.² There are six fundamental rights: Right to Equality, Right to Freedom, Right Against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, and Right to Constitutional Remedies. The Right to Equality, among them, has had a profound 'impact' on the provision of educational opportunities in India. Among the directive principles of state policy, which are not justiciable, has included the promise that there will be compulsory primary education for children upto the age of fourteen within 10 years of the adoption of the Constitution (that is by the year 1960).

Education commissions and committees were set up from time to time by the Government of India to examine the status of educational development and advise the government on future policies, programmes and strategies. Prominent among them have been the University Education Commission (headed by Dr S. Radhakrishnan, 1948), the Secondary Education Commission (headed by Sir A. L. Mudaliar, 1952), and the Education Commission (headed by Dr D. S. Kothari, 1966). The more recent development is the adoption of a new National Policy on Education (NPE) (1986). There are also reports on language policy and emotional integration (Dr Sampurnanand Committee), Moral and Spiritual Education (Sri Prakasha), Vocational Education (Ishwarbhai Patel Committee), Work Experience in Schools (Malcolm Adisheshaiah Committee, Kulandaivelu Committee), etc. In addition, such national bodies as the CBE, NCERT, NIEPA, AICTE, ICMR, ICSSR, CSIR and UGC have been, on a regular basis advising the Government of India on the education of its people pertaining to different aspects and levels.

The recommendations of many of these committees and commissions and other bodies, constitutional prescriptions and provisions, planning efforts, etc., may be summarized as follows and taken as a broad statement of national policy on education:

- (a) to provide, as far as possible, early childhood care and education to children in the age-group 3 to 5;
- (b) to provide free and compulsory education for all children until they complete the age of fourteen years (Article 45, Part IV of the Constitution);
- (c) to expand secondary education on a large scale;
- (d) to increasingly vocationalize higher secondary education;
- (e) to provide university education to those who are willing and qualified to receive such education, consistent with the demands for trained manpower and the need to maintain essential standards;
- (f) to develop professional, technical and vocational education so as to supply skilled personnel for agriculture, industry and the services;
- (g) to identify talent among different social groups and sexes and help it to grow to its full potential;
- (h) to eliminate regional disparities in the growth of educational facilities and equalize educational opportunities for all (Article 15(4) and Article 46 of the Constitution);
- (i) to liquidate mass illiteracy through a programme of adult and continuing education; and
- (j) to provide general higher education for those who desire it as life-long education through distance education and open university systems.

Keeping in view these broad policy guidelines, it is worth reviewing the growth and development of education in India in the context of population change over a period of time. In other words, it is proposed to examine the impact of population growth on the provision of educational facilities and services, keeping in view the national policy guidelines in education.

EARLY CHILDHOOD CARE AND EDUCATION

The value of early childhood care and education in a population policy needs no emphasis. Immunization, nutrition, hygiene and health care leading to a lower

infant mortality rate, consequently lower family-size and a slackening of the population growth rate, are all intricately interrelated. They ought to form an integral component of early childhood care and education for expectant, lactating and weaning mothers as well as young children. This was well recognized in piecemeal ways through the Applied Nutrition Projects (ANP), NMEP, NSEP, multi-purpose health schemes and pre-school education by the state from the mid-fifties. However, they were given a fillip and sound footing only after 1974 when for the first time the National Policy for Children was mooted. During the closing stages of the fifth plan period they were integrated into a package of welfare services called the ICDS or Integrated Child Development Services Project and launched on a nation-wide basis. Health, nutrition and education are integrated into a single package. Both mothers and infants are covered in this programme. The National Policy on Education (NPE) and the Programme of Action have given a good coverage of the services of ICDS and other programmes like creches, day-care centres, etc. However, it is to be noted that even now the care of the child from 0 to 5 is not a constitutional responsibility of the state as it is in case of the child from 6 to 14.

PROGRESS OF PRE-SCHOOL EDUCATION IN INDIA

Pre-school education has several merits. One of the recently realized merits of the pre-school education is its potential to promote primary education. If a pre-school centre is attached to a primary school, girls who have to take care of infants and thus cannot attend schools, would be free from this responsibility, as both of them can come together and the infant can be in the pre-primary school, while the 6 to 14 year old girl can attend primary school. Even as late as in 1960 there were just 1909 pre-primary schools in India. They were mostly in urban areas. The figure rose steadily and slowly to 10782 by the year 1979-80. The growth rate has been very slow and the base being very weak. But with the starting of Balwadis and Anganwadis (by the Ministry of Social Welfare or Ministries of Women and Child Welfare in some of the states), there has been enormous expansion in the number of pre-primary school centres, especially in rural areas. They are monitored through the ICDS blocks which have a coverage in nearly 50 per cent blocks (corresponding to revenue taluqs) in the country.

However, owing to the pressures on resources created by the growing number of infants in the country, the coverage of children (0 to 5 years) who receive all the essential services, is hardly 10 per cent as reflected in NPE and POA (1986).

UNIVERSALIZATION OF PRIMARY EDUCATION

The efforts: The Constitution of India, under Article 45, enjoined that within a period of ten years all children in the age-group 6 to 14 would be provided with a minimum of primary education. A progress review of universalization of primary education was made across the country in 1960. The review showed unsatisfactory progress. It was felt that people do not feel encouraged to send their children to schools. Legal provisions were felt necessary so as to compel the people to send their children to schools. Hence, the compulsory primary education acts were passed by almost all the states of India during the years 1961-62. Attendance officers were also appointed in many of the states to ensure enrolment and regular attendance of children. Compulsion, however, did not succeed as parents offered stiff resistance for various apparently justifiable reasons such as poverty, need for child labour to supplement family income or saving on labour expenditure by using family labour, care of the young, household management including water-supply from distant water sources, etc. This action was also defended in the name of individual liberty. Finally, the word 'compulsory' in the Compulsory Primary Education Act was reinterpreted to mean: 'It is compulsory for the government to provide facilities for primary education if the parents so choose to provide such education for their children. But it is not compulsory for parents to send their children if they do not choose to do so'.

The 1971 Census showed that primary education had made little impact on literacy in the country. Enrolment targets had not been reached. Though the gross enrolment (I to V standards) was nearly 90 per cent, the net enrolment continued to be as low as 65 per cent. Non-enrolment of children, when they attained the age of admission to primary schools (that is, 5 years and 10 months), late enrolments, and drop-outs are some of the factors responsible for a low net enrolment ratio. A number of studies has shown that school drop-outs are engaged either in paid work, or unpaid but valuable work, at home, in the farm or the field, or in some household industry, etc. Drop-outs who are engaged in paid work (child labour) in rural areas are estimated to be over 20 per cent⁵. Child labour in urban areas is estimated to be around 25 per cent⁶. These figures exclude those who are engaged in unpaid work. Nearly 94 per cent of the non-enrolled and drop-out children do work of value to the home and are not idlers. As a result, the Government of India introduced through the states during the fifth plan period (1978), a system of non-formal education for non-enrolled and drop-out children in the age-group of 9 to 14 years. It consists of part-time education and a continuing education programme of 10 months duration each (the duration differs from state to state), wherein literacy and numeracy are the sole objectives of education. Basic proficiencies which require an

attendance in I to IV standards of formal primary education will be imparted in two years of non-formal education. A student will be eligible thereafter to join the V standard of school education. At present, there are two on-going programmes for universalization of primary education: formal primary education and non-formal education during 9 to 14 years.

Performance in UPE: Gross enrolment ratio (GER) in 1950-51 at the primary level (I to V standards) were 59.8 per cent for boys and 24.6 per cent for girls. There were 13.76 million boys and 5.3 million girls in schools. The figures rose to 34.99 million by 1960-61 of which 23.59 million were boys and 11.40 million were girls. Still as a proportion, the GER remained at 62.4 per cent with boys recording 82.6 per cent and girls recording 41.4 per cent. Enrolments rose to 57.05 million by 1970-71, of which 35.76 million were boys and 21.31 million were girls. Still as a proportion, the GER remained at 78.6 per cent with boys recording 95.0 per cent and girls recording 60.5 per cent. Enrolments rose to 99.3 per cent for boys, 65.0 per cent for girls and 82.7 per cent in total by 1979-80. During the year 71.56 million children were in schools. By 1986, there were 86.68 million children in schools and the GER had risen to 93.63 per cent. As such, 100 per cent universalization of primary education still remains a dream.

In regard to upper primary education (VI to VIII standards) it is observed that hardly 5.44 million children were in schools in 1958-59. The figure rose to 19.28 million by 1979-80 and by 1986 it stood at 27.20 million children. The GER in 1958-59 was 20.7 per cent and it was still 39.6 per cent in 1979-80 and 48.51 per cent in 1986. The sex-wise position in 1986 was that 17.56 million boys and 9.64 million girls were in schools. The growth rate for girls during 1958-59 to 1979-80 had again been slightly higher than that of boys because of a weaker base enrolment. Negative growth rate has not been recorded at any time.

Performance of states: The performance of states in the universalization of primary education has been compared at two points of time, 1978 and 1986, with data available from the fourth and fifth All India Educational Surveys. States have been examined in comparison with all-India average performance at the two points of time. A deviation of plus or minus five percentage points is taken to mean that the state falls in the middle range of performance. A state whose percentage of enrolment is lower than 5 per cent of the national average is considered a low-performing state; and a state whose record is higher than 5 per cent of the national average is taken as a high-performing state. In this way states are classified into low, medium and high performing categories. Shifts in these positions from 1978 to 1986 are also considered. From this analysis the following profile of states has emerged. It

is observed that states which have turned out consistently low performance are: Bihar, Haryana, Jammu and Kashmir, Rajasthan and Uttar Pradesh. As is shown in Table 11.1, the states which have deteriorated from medium to low position are: West Bengal and Chandigarh (UT); from high to medium are: Manipur, Punjab, A & N Islands (UT), and Delhi (UT). The other states have done well or maintained their high status (except Orissa which has maintained a medium status).

UPE and drop-out phenomenon: If low-enrolments, late-enrolments and non-enrolments are one dimension of the problem of universalization, another depressing problem is that of 'drop-outs'. Children are withdrawn from schools before they complete a full term of lower primary education. The majority of them drop-out in the first and second years of schooling. Whatever little learning takes place in this short span is forgotten and they lapse into illiteracy. The drop-out rate (classes I to V) was around 65 per cent in 1968, about 60 per cent in 1978 and well over 50 per cent in 1986. For every 100 children who enter standard I of primary education, 45 children complete class IV and hardly 35 children complete class VII. Those who do not complete class IV turn out to be illiterates over a span of time. They become part of the clientele for adult education. Needless to say that the drop-out rates are still higher for girls, scheduled castes and scheduled tribes.

UPE and incentive schemes: The government has launched since the sixties various schemes wherein incentives are provided to children to attend schools. Parents should also feel a lesser burden in sending children to schools. Some of these schemes are: mid-day meals for children, free uniforms, free textbooks, attendance scholarships, pre-matric scholarships, merit-scholarships, residential facilities, etc. The number of children who benefitted under mid-day meals, free uniforms, free textbooks in the lower primary schools in 1986 was 13.60 million, 11.04 million and 20.17 million respectively. Their proportion to the total number of children works out to be 20 per cent, 16 per cent and 30 per cent respectively. A large number of children is still left uncovered. Research studies have shown that some of these schemes, such as the attendance scholarship scheme, definitely influence attendance, retention and the consequent success of universalization⁷. Some states like Tamilnadu and West Bengal are doing well in the provision of incentives to children. States like Bihar, Himachal Pradesh, Jammu and Kashmir, Uttar Pradesh and Rajasthan are lagging behind in the provision of incentives to children. In a later section, we shall expand on the impact of population growth on the provision of these incentives which are crucial for the success of universalization of elementary education.

Table 11.1 : Performance in Universalization of Primary Education (Enrolments), 1978 and 1986-Regional Profile

All India (I to V 6-11 years)		1978 GER : 81.65per cent		1986 93.63 per cent			
CH	CM	CL	Improved			Deteriorated	
			L to M	M to H	L to H H to L	H to M	M to L
Goa	Orissa	Bihar	Arunachal	Andhra		Manipur	West Bengal
Gujarat		Haryana	Pradesh	Pradesh		Punjab	Chandigarh
Himachal Pradesh		Jammu & Kashmir	Assam	Tripura		Andaman & Nicobar	
Karnataka		Rajasthan	Madhyu			Island	
Kerala		Uttar Pradesh	Pradesh				
Maharashtra						Delhi	
Meghalaya							
Mizoram							
Nagaland							
Sikkim							
Tamilnadu							
Dadra and Nagar Haveli							
Lakshadweep							
Pandicherry							

- Note*
1. In real terms, there is no decline in the growth of enrolment in West Bengal, Chandigarh or other states under deterioration list. The classification is to be taken only in a relative sense.
 2. Birth rate is very much higher than the national average in 'CL' Category States except in J & K.

Source : Family Welfare Programme in India, Ministry of Health and Family Welfare, Y.B. 85-86, Table 8.4, p. 77.

- Legend.* CH. Consistently High (1978 and 1986, at least 5 per cent above national average)
 CM. Consistently medium (1978 and 1986, less than 5 per cent high or low from national average)
 CL. Consistently low (1978 and 1986, at least 5 per cent below of national average)

Improved			Deteriorated	
L to M	Low to Medium	H to L	High to Low	
M to H	Medium to High	H to M	High to Medium	
L to H	Low to High	M to L	Medium to Low	

Non-formal Education (NFE) for UPE: During the late seventies a nation-wide scheme of non-formal education was launched to give a second opportunity for non-enrolled and drop-out children to attend schools during the early mornings or late evenings when they are relatively free from farm, field or household work. There were 1,18,501 NFE centres in 1986, of these 93 per cent being rural. The total enrolment stood around 3.4 million children. States like Andhra Pradesh, Bihar, Madhya Pradesh, Uttar Pradesh and West Bengal are a little ahead of others in the provision of non-formal education. It is observed that by 1986 the total number of children who completed lower primary education (I to V) was around 42 million, out of a total of 86 million children. Another 44 million children were left out. There were a few million non-enrolled children also. The Non-Formal Education Programme covers 3.4 per cent out of the 44 million drop-outs who do not constitute even 10 per cent of the eligible drop-out population. Non-formal education is essentially designed for scheduled castes, scheduled tribes, girls and the poorest of the poor, who are usually the non-enrolled and drop-out children and who fail to benefit from formal education. But research studies have shown that even in non-formal education programmes, it is the non-scheduled castes and boys who mostly participate⁸. The foregoing discussion has tried to highlight the magnitude of the problems of universalization of primary education. It is to be seen to what extent the population growth in India has affected the universalization of primary education.

IMPACT OF POPULATION GROWTH ON UNIVERSALIZATION OF PRIMARY EDUCATION

It is observed that there has been considerable effort on the part of the state to universalize primary education. However, these efforts have not met with total success. Even after 40 years of independence universalization of primary education has remained a half-dream, half-reality. There are various reasons for this state of education in the country. One of them is definitely the problem of rising numbers, and the ever-growing demands for facilities and services which have been unleashed by the enormous growth of population during the last forty years. The various educational areas which have been affected adversely by the population growth are: decline in per-pupil expenditure on primary education; rise in non-plan expenditure and decline in plan expenditure, thereby affecting the quality of schooling and provision of incentives for children under the various incentive schemes; unfavourable teacher-pupil ratio; creation of non-viable schools; low

quality education; etc. These situations which are the result of population growth, indirectly contribute to high drop-out phenomena, low quality outputs and consequent partial success of universalization of primary education in India.

IMPACT OF POPULATION GROWTH ON DEMAND FOR FACILITIES AND SERVICES

Schooling Facility: India is a land of villages and 80 per cent of the people live in rural areas. A primary school is a basic educational facility for a rural settlement. There has been a steady and enormous expansion of primary schooling in India to satisfy the ever-growing demand for schooling, consistent with the national objective of universalization of primary education.

The number of primary schools in India during 1960, 1965, 1970, 1975 and 1979 are 3.30, 3.91, 4.08, 4.50 and 4.82 lakh respectively. The number of upper primary schools for the same periods are 0.49, 0.76, 0.91, 1.07, and 1.15 lakh. The figures as per the fifth AIES are 5.29 lakh and 1.39 lakh. The fourth survey reported that with a few exceptions, no child needed to walk for more than 1 kilometre to attend the school. The fifth survey has reported that inspite of growing demands, educational facility has been provided to 94.6 per cent of rural population either within the village or within a walking distance of 1 kilometre. This is definitely a great achievement for a developing country which has the dubious distinction of being second in the world in terms of the size of its population. But if one thinks of a 'norm' of quality which a school should achieve (i.e. the maintenance of certain minimum standards of facilities and services), then a great majority of schools do not satisfy the norm or even come near it. Also the situation is not so bright as far as accessibility of upper primary education is concerned.

Teacher-Pupil Ratio: Another important problem in the area of primary education is the proliferation of single-teacher schools. They are both a boon and a curse. Given the limited resources, and the concern for universalization of primary education, one has to reconcile, for a transitional period, with the single-teacher schools. Looking at the results in terms of enrolment, retention, learning process, achievement levels, etc, one would definitely press for a multi-teacher schools. It is difficult to give the needed attention to children belonging to four or five different classes at the same time. The number of children attending also keeps growing over the years. Nearly three-fifths of Indian schools during the sixties were single-teacher schools. During the seventies this figure was reduced, with about half the schools being single-teacher schools. In 1986 there were hardly 28 per cent single-

teacher schools. Even then, only 15 per cent of schools were in the ideal situation of having one teacher for each of the five lower-primary classes. Of course, these were mostly urban schools, serving the elite sections of society. In fact, the new education policy came out with a grand strategy called the Operation Blackboard (OB). Apart from improvements proposed in the school plant, teaching aids and other essential facilities, OB envisages the conversion of all single-teacher schools into at least two-teacher schools. This is a commendable objective which has, however, stupendous financial implications. Research has revealed that drop-out rates are lower in multi-teacher schools as well as in schools where physical facilities are better. Another notable feature is that it is proposed to appoint at least one woman teacher for every primary school. This is a welcome measure, as more girls enroll in schools with women teachers. At the moment only 30.56 per cent of teachers in primary education are women.

In spite of all these measures to expand and strengthen primary education over the years, it is observed that the teacher-pupil ratio is still low. It used to be 1 teacher for every 39 children in the early seventies at the lower primary stage. It fell to 1 teacher for every 44 children by 1986-87. The corresponding figures for upper primary stage are 31 and 29.

Quality of Schools: Theoretically, it is possible to conceive of a norm for running a primary school. Keeping in view the objectives of education to be achieved, the size of clientele to be covered, the modern psychologically and scientifically approved methods of education to be pursued, the curricular and co-curricular activities to be performed (which ought to reflect the objectives), the learning and evaluation processes required for the same, etc., a 'norm' for a school can be established. In spite of the enormous expansion of schooling facilities, it is observed that only a few hundred schools in India satisfy the 'norm' and qualify to be called quality-schools. There are schools without buildings—schools which are run in temple premises, mosques, thatched huts, panchayat offices, etc. More than 50 per cent of schools do not have drinking water facilities and urinal/lavatory facilities. Many schools do not have blackboards and tarred walls are used for writing on. The lack of seating facilities, maps, charts, pictures, teaching aids, library books, children's literature, playground, play-equipment, furniture, wall-clock, etc., bring down the quality of primary education. The All India Educational Surveys, have periodically thrown light on the status of schools in regard to these facilities. With the growing numbers and increasing demand, it has been difficult to provide primary education of a minimum quality. With the quantum of population growth that has taken place in the last forty years, it appears that in India a huge sum of money is being poured into bottomless pots with the objective of filling up the pots.

Expenditure on Primary Education: India spent Rupees 114 million on education in 1950-51, at a rate of Rs. 35.60 per pupil. In 1979-80 it spent Rupees 3,500 million (both are at current prices), but the rate per pupil went up to Rs. 368.50. *Though the total expenditure went up by nearly 31 times in these 29 years, the per-pupil expenditure went up by only around ten times.* One prominent reason for this is the unprecedented growth in the number of students who need to be covered. Again the proportion of GNP spent in 1950-51 was 1.2 per cent, while in 1979-80 it was 3.4 per cent. If one were to look at educational expenditure in terms of current prices and constant prices, it is observed that the per pupil expenditure of Rs. 368.50 in 1979-80 is equal to Rs. 80.40 of 1950-51. In other words the expenditure per pupil has gone up only 2.3 times. On the other hand, even in terms of constant prices, the total volume of Rupees 3,500 million spent in 1979-80 is equivalent to Rupees 764 million at 1950-51 prices, which works out to nearly 7 times the base-year expenditure.

One depressing feature of educational expenditure in India is the unfavourable balance between the plan and non-plan expenditures. The proportion of plan expenditure is declining and the balance is continuously tilting in favour of non-plan expenditure. Non-plan expenditure is used mostly for paying the salaries of teachers. Plan expenditure is used for creating new schools and essentially for qualitative improvement of school-facilities. Teachers are mainly from the top 60 to 70 per cent of the economic strata of Indian society, while children are expected even from the lowest 30 to 40 per cent economic strata. Expansion of schools became a handy tool to provide employment to 60 to 70 per cent of the economic strata and for this, non-plan expenditure was made. Concomitant provision of facilities and services for these schools which would have benefited the lowest strata, did not take place. Plan expenditure on qualitative improvements of schools would definitely serve the lowest strata of society. But this is not happening. For instance, 28 per cent of the total expenditure on education was on the plan side in 1950-51, when there was no real mass education in India. It was 38 per cent in 1960-61 and 41 per cent even in 1965-66. It was only after this period that real expansion of schooling and mass education started. Later on the proportion of expenditure fell, and was down to 14 per cent by 1980-81. In India 86 per cent of expenditure on education goes to pay the salaries of teachers and non-teaching staff. The percentage of 'plan outlay' came down from 7.9 per cent in the first five year plan to 3.6 per cent in the seventh five year plan, though in terms of volume it went up from Rupees 304 million in the first plan to Rupees 1894 million in the seventh plan (both are at 1970-71 prices). At current prices it was Rupees 6383 million in the seventh plan.

Analysis of the pattern of expenditure on various levels of education in India reveal that it is the elementary education that has suffered over a period time. For

the masses of Indian people, education means elementary education. As a proportion to the total expenditure on education, the expenditure on primary education has gone down from 56 per cent in the first plan to 36 per cent in the sixth plan. The seventh plan outlay was 29 per cent. The other levels of education have increased their proportions and firmed up over a period of time. In per-pupil terms, for every rupee that is spent on primary education (1975-76 data) Rs. 6 are spent on college education (general) Rs. 16.10 are spent on college education (professional) and Rs. 62.50 are spent on university education.

Adult education: It is shocking to note that according to a World Bank estimate, there will be 954 million illiterates in the world by A.D. 2000 and 500 million out of them will be in India alone⁹. Of the total illiterates in the 15 to 19 age group by A.D. 2000, 54.3 per cent will be in India.

When one looks at the percentage of literacy in India over a period of time, it is observed that there has been a steady increase from 16.67 per cent literacy in 1951 to 36.27 per cent in 1981. The crude average growth rate is hardly 0.653 per cent per year in this 30 year period. Though in terms of proportions there is a steady increase (however slow) nevertheless in terms of absolute figures the number of illiterates in the country increased from 300 million in 1951 to 437 million in 1981. This is essentially due to the enormous growth in population in the country. Wide disparities are observed between literacy rate for the country in general (36.2 per cent) and that of scheduled castes (21.4 per cent) and scheduled tribes (16.4 per cent). There are sex differences in favour of males in all these categories. Again there are rural-urban disparities and inter-state variations. The states which have low literacy rates are Andhra Pradesh, Bihar, Jammu and Kashmir, Madhya Pradesh, Rajasthan and Uttar Pradesh. Kerala, Tamil Nadu, Gujarat, Himachal Pradesh, Maharashtra, and Nagaland are quite ahead of the others. Except Arunachal Pradesh (1981) and Dadra and Nagar Haveli, literacy is quite high in other union territories.

There are two types of on-going efforts in adult education. They are the centrally sponsored projects, and the state sponsored projects. These centrally sponsored projects are of four-month duration for the target group 15 to 35 and are called as Rural Functional Literacy Projects. The state sponsored projects are of 10-month duration for the 15 to 35 age-group. There are also state-assisted and voluntary-organisation-managed projects such as those managed by the State Adult Education Councils or Boards (in some states only) which are of 10-month duration for all age groups.

Following the new education policy, a technology mission for the eradication of illiteracy has been launched. It includes the provision of lighting facilities, supply of printed materials and audio-visual aids, use of TV and radio for adult education. In addition, a programme of post-literacy and continuing education has also been launched for drop-outs from adult education centres, and neo-literates in order to retain the utility of regular adult education programmes. A cluster of villages is identified for the purpose, where a Jana Shikshana Nilayam (People's Education Centre) will be located. This is also proposed to act as a centre for cultural transmission, information-dissemination, developmental socialization and conscientisation of the rural masses. Specialized programmes benefiting ICDS (through Mahila Samakhya programmes such as FLOW or Functional Literacy of Women), IRDP, NREP targeted groups are also being implemented.

However, all these efforts would not be able to eradicate illiteracy by the turn of the century, because of the steady growth of population in India and the existing constraints of political economy of public expenditure on adult education. The literacy situation is estimated for one of the middle ranking states in India, the Karnataka state, whose literacy in 1981 was 38.46 per cent (all-India being 36.23). By the turn of the century Karnataka can reach a general literacy of 55 per cent and an effective literacy of 61 per cent provided the on-going efforts are maintained¹⁰. It is estimated that there will be 39 million adults (15 and above) in Karnataka state in a total population of 55.5 million by A.D. 2001, and out of these 39 million, 13 million adults will be illiterate. At present the coverage of illiterate adults across the country in adult literacy programmes ranges between 10 to 15 per cent of the eligible adults. The expenditure on adult education in any year has not exceeded 2 per cent of the total expenditure on education in India. For instance, in 1985-86, out of the total expenditure of Rs. 70.837 million on education, hardly Rs. 17 million were spent on adult education. Out of this, Rs. 10 million was spent on the non-plan side and Rs. 7 million on the plan side. At this rate, it is difficult even to imagine (not estimate) a probable date by which illiteracy will be eradicated in India. The social sin of tolerating illiteracy will be perpetuated in the country. The people also are responsible for this social sin, as they contribute to the growing number of illiterates.

EDUCATION OF THE SOCIALLY DISADVANTAGED

References to the socially disadvantaged in educational efforts at the national level have already appeared in the preceding pages. However, a special discussion on the education of this group seems necessary.

India is a multi-tiered society. There is deep-rooted social stratification which is both vertical and horizontal in nature. Caste and class form the bases of vertical stratification. Sex is the basis of hierarchical and discriminatory treatment across caste and class. According to the 1981 census, 15.75 per cent of the total population in India were scheduled castes and 7.76 per cent were scheduled tribes. Together they constitute 23.51 per cent of the total population of India. As is shown by several socio-economic and other indicators of quality of life, they are the most deprived, disadvantaged and suffering sections of the Indian population. Article 15 (4) and Article 46 (for scheduled castes and scheduled tribes and backward classes) of the Constitution of India enjoin the state to provide special privileges, attention, facilities and services to these socially disadvantaged groups. The scheduled castes are in greater proportions in Punjab, Himachal Pradesh, Uttar Pradesh, West Bengal, Tamil Nadu, Haryana, Rajasthan and the Union Territory of Delhi. The scheduled tribes are in greater proportions in the frontier states as well as in Madhya Pradesh, Gujarat and Orissa. Even the minorities, especially Muslims, constitute a section of the socially disadvantaged population.

In addition to the scheduled castes and tribes, there are also backward classes, economically deprived groups, and physically handicapped groups who deserve special attention. Their proportion varies across the states. They are served by the Department of Social Welfare, apart from the Department of Education in the states and the union. In some states, separate departments have been created for the welfare of the scheduled castes and tribes, of women and children and of the backward castes. Studies have shown that the growth rate in enrolment of children from socially disadvantaged groups (SCs, STs and girls in particular) are higher than that of the general growth rates¹¹. This is because of weak base position in the 50s. The direction of change in India appears to be positive. However, in terms of speed, the change is quite slow and sluggish. At this rate of growth and with the growing population of school-age children, it will be no wonder if even the direction becomes negative. The proportion of SC enrolment in I to V standards in 1981 was 17.35 per cent and that of ST was 8.07 per cent. The proportion of SC teachers in primary schools (I to V) was 11.22 per cent and that of ST teachers was 5.99 per cent. This was out of a total of 15.30 million teachers. The proportions decrease as the level of education increases. It will be difficult to realize equality among people through education unless this trend is radically changed.

EDUCATION IN A.D. 2000

With 685.2 million people in the country in 1981, India was ranked second in the world in terms of its population size. This is a common knowledge. According to an

estimate, the population in India has crossed the 800 million mark in 1988. The most optimistic projection by Cassen and Dyson shows that India will have 967.7 million people by A.D. 2001. The Registrar General of India has put it at 991.4 million. The medium-term projection of J. P. Ambannavar puts it at 998.69 million and C. Chandrasekharan has estimated it to be 1012.0 million. The population of India in 1971 (547.9 million) doubled from what it was in 1921 (251.2 million). It may be nearly quadrupled by the turn of the century. It took 50 years for the first doubling with 1921 as base year and it will take hardly 30 years for the second doubling taking 1971 as base year. A large part of this population in A.D. 2000 will be poor and starving. Population between the age group of 15 and 59 years will form 60.79 per cent of the total by A.D. 2000. Including the population of 60 years, there will be 67.37 per cent, or nearly 673 million adults by A.D. 2000 (VII Five Year Plan). In spite of the best of efforts to promote literacy, around 350 million adults will still remain illiterate by the turn of the century. Of the total population of 1000 million, nearly 390 million will be struggling to receive adequate food everyday, not to speak of health, education and other welfare services. This figure is higher than the total population of India in mid-century when she had become independent.

The chief problem for education by A.D. 2000 will be to find resources for education. There is an increasing crunch on resources and this will continue in the years ahead. At present the state governments are earmarking one-fourth of their annual budget for education. Together the state and the union are spending nearly one-sixth of their total annual budget on education. At the moment, five-and-a-half per cent of the nation's net national product is being spent on education. There has been a quantum jump from an average of 3.5 per cent in the preceding years to 5.5 per cent in 1986. This level of expenditure may continue. However, much of it will go for qualitative improvements in formal primary education, secondary and higher education. Non-formal education for drop-outs and non-enrolled children, as well as adult education will continue to get lower priority in terms of lower shares of expenditure. Normally the poorest of the poor are the clientele for both these programmes. This will be so, in spite of the National Literacy Mission, launched in 1988, following the NPE, 1986.

One of the promising solutions in sight is to reduce the pressure on resources by narrowing the demand for facilities and services. This can be done by regulating the growth of population for increasing the welfare of the people and raising the quality of life. The simple law of economics relating to supply, demand and prices operates here, though many caveats have to be conceded. Increasing supply can bring down prices at constant demand. But the supply position is such that it may not satisfy unlimited and growing demand. Hence, alternatively, demand should be drastically

reduced for the given supply. The demand for education created by population should be reduced and the pressure on resources be relaxed for getting a better quality of life. Even if the situation in regard to production is not dismal and the supply (of resources) position may be bright by the turn of the century as has been predicted by Raj Krishna (1986),¹² still it has been observed¹³ that the given supply may not reach cross-sections of population below the poverty-line. Their capacity to get services may not grow. Amartya Sen¹⁴ has defined welfare as increasing the capabilities for self-sustaining growth of the individuals. One of the techniques of developing such capabilities is through the provision of education, the knowledge and skill component of which will lead to the freedom of man. Such welfare may not flow to a large section of the Indian population. Thus, inequality levels will keep growing by A.D. 2000 unless determined efforts are made in an integrated way. Efforts should be made not only to raise resources for education and equitably spread them, but also to delimit the pressures on available human and environmental resources which also include educational resource.

REFERENCES

1. Coale, Ansley and Hoover, Edgar M., *Population Growth and Economic Development in Low-Income Countries*, Princeton, New Jersey, Princeton University Press, 1958.
2. Austin, Granville, *The Indian Constitution: Cornerstone of a Nation*, Bombay, Oxford University Press, 1972.
3. Government of India, *National Policy on Education, 1986*, New Delhi, MHRD, Department of Education, 1986.
4. Government of India, *Education in India*, Annual Volumes, New Delhi, Ministry of Education.
5. Seetharamu, A.S. and Ushadevi, M.D., *Education in Rural Areas: Constraints and Prospects*, New Delhi, Ashish Publishing House, 1985.
6. Seetharamu, A.S., *Education in Shums*, New Delhi, Ashish Publishing House, 1982.
7. Premala Bai, D., *A Study of the Extent and Problems of utilisation of Education Facilities by the Scheduled Castes and Scheduled Tribes at the Primary School Stage*, Unpublished Ph. D. Thesis, ISEC, University of Mysore, 1985.
8. Sakuntala, S.N., *A Study of Non-formal Education Programme in Karnataka State for the age-group 9 to 14 Years*, Unpublished Ph. D Thesis, ISEC, University of Mysore, 1988.
9. Government of India, *Challenge of Education - A Policy Perspective*, New Delhi, Ministry of Education, August, 1985.
10. Seetharamu, A.S., 'Education in Karnataka State: 2000 AD ' *Journal of Education Planning and Administration*, Special Issue on Educational Planning, Vol. 2, No. 1 and 2, January & April 1988.

11. Premala Bai, D., *op. cit.*
12. Krishna, Raj, 'Economic Outlook for India', in James R. Roach, ed., *India 2000 : The Next Fifteen Yers,* Festival of India in US Symposium Volume, Maryland, The Riverdale Co, 1986.
13. Srinivasan, K.S., Kukarni, S. and Parasurama, S., 'Impact of Alternative Growth Trends of Population on Selected Social and Economic Sectors in India,' *Economic and Political Weekly*, September 1988.
14. Sen, Amartya, *The Standard of Living*, The Tanner Lectures 1985, Cambridge University Press, Cambridge, 1987.

DOCUMENTS USED

1. Annual Reports of the Ministry of Education, G.O.I.
2. Fourth and Fifth All India Educational Survey Reports, NCERT
3. Challenge of Education, Policy Discussion Paper, 1985, G.O.I.
4. National Policy on Education 1986 and Programme of Action 1986, G.O.I.
5. World Development Report 1988.
6. Seventh Five Year Plan, and other plan documents, G.O.I., 1985.
7. Annual Reports of the Comptroller and Auditor General of India (for data on expenditure on education).
8. Basic Data, Version 2.03, NIEPA, 1988.
9. World Bank, Education Sector Report, 1980.
10. Census of India, Registrar General, G.O.I., various volumes.

APPENDICES

- I DEMOGRAPHIC GLOSSARY**
- II STATISTICS ON POPULATION AND DEVELOPMENT**
- III ENVIRONMENT**
- IV RESEARCH FINDINGS ON POPULATION AND NUTRITION**
- V GROWING UP**

Appendix - I : Demographic Glossary *

Age-specific fertility rate : the number of births occurring during a specified period to women of a specified age or age group, divided by the number of person-years-lived during that period by women of that age or age group. When an age-specific fertility rate is calculated for a calendar year, the number of births to women of the specified age is usually divided by the mid-year population of women of that age.

Contraceptive prevalence rate : percentage currently using contraception; usually based on married or sexually active couples with women in the reproductive age.

Crude birth rate : the number of births in a year per 1,000 mid-year population.

Crude death rate : the number of deaths in a year per 1,000 mid-year population.

Dependency ratio or age dependency ratio : the ratio of the combined child population under 15 years of age and adult population of 65 years and over to the population of intermediate age per 100.

Eligible couples : the currently married females in the age group 15-44 years.

Foreign-born population : persons born outside the country or area in which they were enumerated at the time of the census.

General fertility rate : the annual number of births divided by the mid-year population of women aged 15 to 49 years multiplied by 1,000.

Gross reproduction rate : a measure of the reproduction of a population expressed as an average number of daughters to be born to a cohort of women during their reproductive age, assuming no mortality and a fixed schedule of age-specific fertility rates. More specifically, it is the sum of age-specific fertility rates for the period multiplied by the proportion of the total births of girl babies.

Growth rate : the exponential average annual rate of population growth expressed as a percentage. It is calculated on the basis of the increase of a population in a period divided by the number of person-years-lived by the population during the

* Largely based on Department of International Economic and Social Affairs, *World Population Policies*, Volume I, New York, United Nations, 1987, pp. 244-45.

same period. The increase in a population is the result of a surplus (or deficit) of births over deaths and a surplus of immigrants over emigrants.

Infant mortality rate : the probability of dying between birth and age 1 multiplied by 1,000; commonly calculated as the number of deaths of infants under one year of age in any given calendar year divided by the number of births in that year and multiplied by 1,000.

Life expectancy at birth : a life-table function to indicate the expected average number of years to be lived by a newly born baby, assuming a fixed schedule of age-specific mortality rates.

Mean age at first marriage (females) : the average age at which women marry for the first time.

Median age : the age which divides the population into two groups of equal size, one of which is younger and the other of which is older.

Natural rate of increase : the difference between the crude birth rate and the crude death rate, expressed per 1,000 mid-year population.

Net migration : the difference between gross immigration and gross emigration.

Net migration rate : the difference between gross immigration and gross emigration per 1,000 of the mid-year population.

Net reproduction rate : a refined measure of the reproduction of population expressed as an average number of daughters that a cohort of newly born girl babies will bear during their lifetime, assuming fixed schedules of age-specific fertility and mortality rates. In other words, it is the measure of the extent to which a cohort of newly born girls will replace themselves under given schedules of age-specific fertility and mortality rates.

Population momentum : The tendency for population growth to continue beyond the time that replacement level fertility has been achieved because of a relatively high concentration of people in the child bearing years.

Rate of natural increase : the difference between births and deaths occurring during a given period, divided by the number of person-years-lived by the population during the same period. The rate, which specifically excludes changes resulting from

migration, is the difference between the *crude birth rate* and the *crude death rate*.

Sex ratio: the number of men per 100 women.

Sex-ratio at birth: the number of male births for each female birth, or male births per 100 female births.

Stationary population: a *stable population* that has a zero growth rate, with constant numbers of births and deaths per year. Its age structure is determined by the majority rates and is equivalent to the person-years-lived (nL_x) column of a conventional life table.

Survival ratio: the probability of surviving from one age to an older one; it is often computed for five-year age groups and a five-year time period.

Total fertility rate: the sum of the age-specific fertility rates over all ages of the child-bearing period; if five-year age groups are used, the sum of the rates is multiplied by 5. This measure gives the approximate magnitude of 'completed family size', that is, the total number of children an average woman will bear in her lifetime, assuming no mortality.

Total marital fertility rate: average number of children that would be born to a married woman if she experienced the current fertility pattern throughout her reproductive span (15-49 years).

Urban population: population living in areas defined as urban by national authorities.

Zero population growth: non change in the size of a population over time because births and immigration equal deaths and emigration.

Appendix II : Statistics On Population And Development *

INDIA : SELECTED DEMOGRAPHIC, HEALTH AND SOCIO-ECONOMIC INDICATORS

<i>Sl. No.</i>	<i>Item</i>	<i>Year of reference</i>	<i>Particulars</i>
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
1.	Population (000) as on 1st March	1981 Census	
	i) Total		6,85,185
	ii) Male		3,54,398
	iii) Female		3,30,787
2.	Decennial growth rate	1971-81	25.0
3.	Sex-ratio (no. of females to 1000 males)	1981 Census	933
4.	Area in sq. kms. (000)	1981 Census	3,287.3
5.	Density of population per sq. km.	1981 Census	216
6.	Proportion of urban population to total population	1981 Census	23.31
7.	Number of districts	1981 Census	412
8.	Number of towns	1981 Census	3,301
9.	Number of development blocks	1980-81	5,011
10.	Number of villages (inhabited)	1971 Census	5,75,936

* Government of India, *Towards Universal Immunization 1990*, New Delhi, Ministry of Health and Family Welfare, 1985, pp. I-VI.

* Government of India, *India's Population: Demographic Scenario*, New Delhi, Ministry of Health and Family Welfare, 1988, pp. 2-28.

<i>Sl. No.</i>	<i>Item</i>	<i>Year of reference</i>	<i>Particulars</i>
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
11.	Broad age distribution of population (percentage to total population) Age groups		
	0-14	1971	42.0
		1981	39.6
	15-59	1971	52.0
		1981	54.1
	60+	1971	6.0
		1981	6.3
12.	Crude birth rate (SRS)	1982	33.3
13.	Crude death rate (SRS)	1982	11.7
14.	Natural growth rate (SRS)	1982	21.6
15.	Infant mortality rate (SRS)	1980	114
16.	Expectation of life at birth	1981-86x	
	Both sexes		54.71
	Male		55.12
	Female		54.31
17.	No. of medical colleges	1982-83	196
18.	No. of hospitals and beds	1-1-1984	
	i) Government		3,925/ 3,62,966
	ii) Private		3,256/ 1,37,662
	iii) Total		7,181/ 5,00,628
19.	Area served per hospital (sq. km.)	1-1-1984	457.74
20.	Population served per hospital	1-1-1984	1,00,866
21.	Population served per bed	1-1-1984	1,447
22.	Hospital beds per 100 population	1-1-1984	0.69
23.	Number of PHCs	1983-84	7,210
24.	Number of sub-centres	1983-84	74,307

<i>Sl. No.</i>	<i>Item</i>	<i>Year of reference</i>	<i>Particulars</i>
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
25.	Number of upgraded PHCs	1983-84	475
26.	Number of doctors (registered with Medical Council of India)	31-12-82	2,71,598
27.	Number of registered nurses (with Nursing Council of India)	31-12-83	1,60,886
28.	Gross national product (Rs in crores)	1982-83	
	i) At current prices		1,45,141
	ii) At 1970-71 prices		54,187
29.	Per capita national income (Rs)	1982-83	
	i) At current prices		1,890.9
	ii) At 1970-71 prices		712.1
30.	Plan outlay on medical, public health including water supply & sanitation and family welfare (Rs in crore)	1983-84	1,716.9
31.	Per capita-expenditure on Medical public health & family welfare (Rs)	1980-81 1981-82	25.67 30.63
32.	Per capita net availability per day of foodgrains (gm.)	1982-83	430.4
33.	Proportion of scheduled castes & scheduled tribes population to total population (percentage)	1971 Census	
	i) Scheduled castes		14.6
	ii) Scheduled tribes		6.9
34.	Religion-wise distribution of population (percentage)	1971 Census	
	i) Hindu		82.7
	ii) Muslim		11.2
	iii) Christian		2.6

<i>Sl. No.</i>	<i>Item</i>	<i>Year of reference</i>	<i>Particulars</i>
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
	(v) Sikh		1.9
	v) Others		1.6
35.	Literacy Rate (percentage)#	1981 Census	
	Persons		36.23
	Male		46.89
	Female		24.82
	Rural		29.65
	Urban		57.40
36.	Percentage of students in primary education to corresponding age-group (6-11 years)	1981-82	83.7 (Pr.)
37.	Work participation rate (percentage) #	1981 Census	
	Persons		33.45
	Male		51.62
	Female		13.99
	Rural		34.76
	Urban		29.23
38.	Percentage of people below poverty line 1977-78		
	Rural		50.82
	Urban		38.19
	Combined		48.13
39.	No. of villages connected by all weather roads	31.3.1982	1,65,166
40.	No. of villages electrified	31.1.1983	3,03,036

SRS : Sample Registration System, Registrar General of India.

X : Revised projection of the Expert-Committee in population projections.

Pr. : Provisional.

: Excluding Assam.

Source: *Health Statistics of India*, DGHS, 1984.

DEMOGRAPHIC TRENDS IN INDIA, 1901 - 81

<i>Census year</i>	<i>Total population (in million)</i>	<i>Annual exponential growth rate (per cent)</i>	<i>Sex ratio (females per 1000 males)</i>	<i>Density of population per sq. km.</i>	<i>Birth rate per 1000 population of decade</i>	<i>Death rate per 1000 population of decade</i>
1	2	3	4	5	6	7
1901	238.4	-	972	77	-	-
1911	252.1	0.56	964	82	49.2	42.6
1921	251.3	(-)0.03	955	81	48.1	47.2
1931	279.0	1.04	950	90	46.4	36.3
1941	318.7	1.33	945	103	45.2	31.2
1951	361.1	1.25	946	117	39.9	27.4
1961	439.2	1.96	941	142	41.7	22.8
1971	548.2	2.20	930	173	41.2	19.0
1981	685.2	2.25	933	216	37.2	15.0

Source: Registrar General of India.

PERCENT DISTRIBUTION OF CHILDREN OUT OF TOTAL POPULATION

<i>Census Year</i>	<i>Age - Group (Years)</i>			
	<i>0-4</i>	<i>5-9</i>	<i>10-14</i>	<i>0-14</i>
1961	15.1 (66.1)	14.8 (64.7)	11.2 (49.3)	41.1 (180.1)
1971	14.5 (79.6)	15.0 (82.0)	12.5 (68.8)	42.0 (230.3)
1981*	12.6 (83.5)	14.1 (93.7)	12.9 (85.9)	36.6 (263.1)

* Excludes Assam and based on 20 percent data.

Source: Registrar General of India (figure in bracket gives the absolute number in million).

MEAN AGE AT MARRIAGE, 1971 AND 1981

<i>India/State</i>	<i>Census Year</i>	<i>Mean Age at Marriage</i>	
		<i>Male</i>	<i>Female</i>
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
India	1981*	23.27	18.33
	1971	23.36	17.16
Andhra Pradesh (11)	1981	23.02	17.25
	1971	22.71	16.22
Bihar (12)	1981	21.47	16.53
	1971	19.84	15.27
Gujarat (4)	1981	23.09	19.51
	1971	22.21	18.43
Haryana (9)	1981	21.67	17.87
	1971	20.52	16.64
Karnataka (6)	1981	25.86	19.20
	1971	25.03	17.80
Kerala (1)	1981	27.19	21.85
	1971	26.74	21.01
Madhya Pradesh (13)	1981	20.57	16.52
	1971	19.72	14.99
Maharashtra (8)	1981	24.28	18.76
	1971	23.57	17.54
Orissa (7)	1981	24.17	19.04
	1971	22.57	17.29
Punjab (2)	1981	24.40	21.04
	1971	23.32	20.18
Rajasthan (14)	1981	20.35	16.09
	1971	19.52	15.07
Tamil Nadu (3)	1981	25.97	20.22
	1971	25.92	19.58
Uttar Pradesh (10)	1981	20.86	17.77
	1971	19.30	15.45
West Bengal (5)	1981	25.66	19.26
	1971	24.28	17.92

* Excludes Assam.

Source: Registrar General of India (figure in bracket represents the rank of the state in terms of 1981 female mean age at marriage in descending order).

**BIRTH RATE BY RURAL/URBAN - INDIA AND
MAJOR STATES, 1986**

<i>India/States</i>	<i>Rural</i>	<i>Urban</i>	<i>Combined</i>
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
India	34.1	27.0	32.4
Andhra Pradesh (8)	32.2	28.7	31.4
Assam (12)	35.5	24.8	34.7
Bihar (14)	36.7	29.6	36.0
Gujarat (10)	32.9	30.8	32.2
Haryana (13)	36.5	29.1	34.9
Himachal Pradesh (7)	31.3	20.0	30.6
Jammu & Kashmir (11)	35.6	25.4	33.5
Karnataka (4)	29.7	26.6	28.8
Kerala (1)	22.3	23.0	22.4
Madhya Pradesh (16)	38.9	30.0	37.1
Maharashtra (6)	31.6	27.0	30.0
Orissa (9)	32.7	26.1	32.1
Punjab (3)	29.0	27.2	28.6
Rajasthan (15)	37.9	29.7	36.4
Tamil Nadu (2)	24.1	23.0	23.7
Uttar Pradesh (17)	39.1	30.7	37.5
West Bengal (5)	33.3	19.7	29.5

Source: Registrar General of India (figure in parenthesis indicates rank of the state in terms of birth rate (combined) in ascending order).

TRENDS IN BIRTH RATE — MAJOR STATES, 1981-86

<i>State</i>	<i>1981</i>	<i>1982</i>	<i>1983</i>	<i>1984</i>	<i>1985</i>	<i>1986*</i>
India	33.9	33.8	33.7	33.9	32.9	32.4
Andhra Pradesh	31.7	31.2	30.8	31.2	29.9	31.4
Assam	33.0	34.2	34.7	35.3	34.3	34.7
Bihar	39.1	37.3	37.2	39.9	37.8	36.0
Gujarat	34.5	34.2	34.2	33.4	33.0	32.2
Haryana	36.5	36.7	35.9	37.2	35.7	34.9
Karnataka	28.3	27.9	29.1	30.3	29.6	28.8
Kerala	25.6	26.2	24.9	22.9	23.3	22.4
Madhya Pradesh	37.6	38.5	38.5	36.9	39.4	37.1
Maharashtra	28.5	29.8	29.8	31.1	29.0	30.0
Orissa	33.1	33.4	34.0	32.7	30.7	32.1
Punjab	30.3	30.4	30.2	30.3	28.5	28.6
Rajasthan	37.1	38.0	40.1	39.7	39.7	36.4
Tamil Nadu	28.0	27.7	27.9	28.0	24.7	23.7
Uttar Pradesh	39.6	38.6	38.4	38.7	37.6	37.5
West Bengal	33.2	32.3	32.0	30.4	29.4	29.5

* Provisional estimates.

Source : Sample Registration System, Registrar General of India.

AGE-SPECIFIC FERTILITY RATES BY RURAL/URBAN - INDIA, 1984

<i>Sector</i>	<i>Age - Group</i>						
	<i>15-19</i>	<i>20-24</i>	<i>25-29</i>	<i>30-34</i>	<i>35-39</i>	<i>40-44</i>	<i>45-49</i>
Rural	92.9	266.9	246.4	174.6	106.6	53.3	25.2
Urban	63.3	228.0	204.5	115.4	59.9	22.6	8.8
India	85.8	257.0	235.9	160.4	95.7	46.7	21.7

Source: Sample Registration System, Registrar General of India.

TRENDS IN AGE-SPECIFIC FERTILITY RATE-RURAL AND URBAN

<i>Age Group</i>	<i>Rural</i>			<i>Urban</i>		
	<i>1972</i>	<i>1978</i>	<i>1984</i>	<i>1972</i>	<i>1978</i>	<i>1984</i>
15-19	115.1	96.2	92.9	75.5	61.2	63.3
20-24	260.9	259.8	266.9	233.5	212.9	228.0
25-29	256.8	243.3	246.4	237.6	190.5	204.5
30-34	205.1	183.5	174.6	175.1	118.5	115.4
35-39	142.0	107.4	106.6	93.8	62.9	59.9
40-44	65.3	50.4	53.3	37.7	22.5	22.6
45-49	31.2	18.0	25.2	15.6	6.8	8.8

Source: Sample Registration System, Registrar General of India

AGE - SPECIFIC FERTILITY RATES - INDIA AND MAJOR STATES, 1984

<i>India/States</i>	<i>15-19</i>	<i>20-24</i>	<i>25-29</i>	<i>30-34</i>	<i>35-39</i>	<i>40-44</i>	<i>45-49</i>
India	85.8	257.0	235.9	160.4	95.7	46.7	21.7
Andhra Pradesh	125.0	249.7	196.8	120.0	63.3	29.5	11.8
Assam	84.3	214.4	235.7	172.4	102.4	41.7	3.8
Bihar	116.0	265.6	288.9	216.8	157.6	85.0	56.6
Gujarat	41.7	292.0	231.2	130.0	65.2	27.3	8.9
Haryana	79.6	312.4	278.1	176.0	90.5	38.7	16.2
Himachal Pradesh	63.8	278.0	215.3	133.8	54.7	25.1	1.1
Jammu & Kashmir	52.1	228.2	258.7	198.4	119.4	54.8	17.1
Karnataka	86.9	233.5	198.3	124.9	70.3	32.7	12.3
Kerala	37.9	168.4	158.5	69.8	32.9	12.4	3.4
Madhya Pradesh	121.0	292.0	253.6	167.3	113.9	56.5	22.5
Maharashtra	91.8	268.8	210.4	119.2	50.3	19.0	6.1
Orissa	72.2	273.7	237.2	154.8	78.5	32.2	12.3
Punjab	27.9	233.9	253.0	139.8	70.4	21.3	4.4
Rajasthan	107.7	304.6	278.0	211.5	128.8	69.4	33.2
Tamil Nadu	61.6	231.6	194.0	107.0	46.3	14.2	4.0
Uttar Pradesh	89.5	280.0	290.9	228.1	156.2	83.7	47.7
West Bengal	84.2	220.0	200.3	135.4	85.2	36.0	14.4

Source: Sample Registration System, Registrar General of India.

**TOTAL FERTILITY RATES BY RURAL/URBAN-INDIA
AND MAJOR STATES, 1984**

<i>India/States</i>	<i>Rural</i>	<i>Urban</i>	<i>Combined</i>
1	2	3	4
India	4.8	3.5	4.5
Andhra Pradesh (5)	4.1	3.5	4.0
Assam (6)	4.4	2.8	4.3
Bihar (11)	6.0	4.9	5.9
Gujarat (5)	4.2	3.4	4.0
Haryana (8)	5.3	3.8	5.0
Himachal Pradesh (4)	4.0	2.6	3.9
Jammu & Kashmir (7)	5.1	3.2	4.6
Karnataka (3)	4.0	3.3	3.8
Kerala (1)	2.4	2.4	2.4
Madhya Pradesh (9)	5.4	4.0	5.1
Maharashtra (3)	4.1	3.3	3.8
Orissa (6)	4.4	3.6	4.3
Punjab (3)	3.9	3.3	3.8
Rajasthan (10)	6.0	4.5	5.7
Tamil Nadu (2)	3.5	3.0	3.3
Uttar Pradesh (11)	6.2	4.8	5.9
West Bengal (4)	4.5	2.4	3.9

Source: Sample Registration System, Registrar General of India (figure in bracket denotes the rank of the state in terms of combined TFR in ascending order).

TOTAL FERTILITY RATES - INDIA AND MAJOR STATES, 1976-78 AND 1982-84

<i>India/States</i>	<i>1976-78</i>	<i>1982-84</i>	<i>Index with 1976-78 = 100</i>
1	2	3	4
India	4.6	4.5	98
Andhra Pradesh	4.3	3.9	91
Assam	4.2	4.2	100
Gujarat	4.9	4.1	84
Haryana	4.9	4.9	100
Himachal Pradesh	4.0	4.0	100
Jammu & Kashmir	4.6	4.5	98
Karnataka	3.7	3.7	100
Kerala	3.1	2.6	84
Madhya Pradesh	5.5	5.2	95
Maharashtra	3.6	3.8	106
Orissa	4.4	4.4	100
Punjab	4.4	3.9	89
Rajasthan	5.0	5.6	112
Tamil Nadu	3.7	3.3	89
Uttar Pradesh	6.0	5.8	97

Source: Sample Registration System, Registrar General of India.

GROSS REPRODUCTION RATE OF MAJOR STATES

<i>GRR Range</i>	<i>States</i>
1.0 - 1.5	Kerala
1.5 - 2.0	Andhra Pradesh, Gujarat, Himachal Pradesh, Karnataka, Maharashtra, Punjab, Tamil Nadu & West Bengal.
2.0 - 2.5	Assam, Haryana, Jammu & Kashmir and Orissa.
2.5 - 3.0	Bihar, Madhya Pradesh, Rajasthan and Uttar Pradesh.

Source: Sample Registration System, Registrar General of India.

ESTIMATED DEATH RATE BY RURAL/URBAN - INDIA AND MAJOR STATES, 1986

<i>India/States</i>	<i>Rural</i>	<i>Urban</i>	<i>Combined</i>
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
India	12.1	7.6	11.1
Andhra Pradesh (8)	10.7	7.1	9.9
Assam (11)	12.9	7.9	12.6
Bihar (13)	14.1	8.5	13.6
Gujarat (9)	11.3	8.6	10.5
Haryana (4)	9.2	6.1	8.5
Himachal Pradesh (6)	8.7	7.2	8.7
Jammu & Kashmir (4)	9.0	6.8	8.5
Karnataka (5)	9.3	6.8	8.6
Kerala (1)	6.7	6.9	6.7
Madhya Pradesh (13)	14.8	8.7	13.6
Maharashtra (3)	9.7	6.0	8.4
Orissa (12)	13.4	7.8	12.9
Punjab (2)	8.7	6.5	8.1
Rajasthan (10)	12.5	8.4	11.7
Tamil Nadu (7)	10.7	7.0	9.4
Uttar Pradesh (14)	15.7	10.0	14.6
West Bengal (6)	9.5	6.7	8.7

Source: Sample Registration System, Registrar General of India (figure in bracket denotes the rank of the state in terms of combined TFR in ascending order).

TRENDS IN DEATH RATE - INDIA AND MAJOR STATES, 1981 - 86

<i>State</i>	<i>1981</i>	<i>1982</i>	<i>1983</i>	<i>1984</i>	<i>1985</i>	<i>1986*</i>
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>
India	12.5	11.9	11.9	12.6	11.8	11.1
Andhra Pradesh	11.1	10.6	10.4	11.0	10.3	9.9
Assam	12.6	12.4	12.1	13.2	13.2	12.6
Bihar	13.9	14.1	13.0	14.5	15.0	13.6
Gujarat	12.0	11.7	11.6	10.8	10.8	10.5
Haryana	11.3	9.2	9.0	10.9	9.1	8.5
Karnataka	9.1	9.2	9.3	9.6	8.8	8.6
Kerala	6.6	6.6	6.7	6.4	6.5	6.7
Madhya Pradesh	16.6	14.9	14.5	14.2	14.2	13.6
Maharashtra	9.6	8.8	9.2	9.4	8.4	8.4
Orissa	13.1	13.0	12.5	14.4	14.0	12.9
Punjab	9.4	8.4	9.5	9.0	8.9	8.1
Rajasthan	14.3	12.1	13.6	14.3	13.2	11.7
Tamil Nadu	11.8	11.2	11.7	10.8	9.5	9.4
Uttar Pradesh	16.3	15.1	15.7	17.8	15.8	14.6
West Bengal	11.0	10.4	10.3	10.7	9.6	8.7

* Provisional estimates.

Source: Sample Registration System, Registrar General of India

ESTIMATED DEATH RATES BY SEX AND BY RURAL/URBAN-INDIA, 1984

<i>Sector</i>	<i>Males</i>	<i>Females</i>
Rural	13.5	14.0
Urban	8.8	8.3
India	12.4	12.8

ESTIMATED DEATH RATE BY SEX - MAJOR STATES, 1984

<i>India/States</i>	<i>Males</i>	<i>Females</i>
India	12.4	12.8
Andhra Pradesh	11.2	10.8
Assam	13.8	12.6
Bihar	13.5	15.7
Gujarat	11.0	10.6
Haryana	9.7	12.2
Himachal Pradesh	11.0	9.7
Jammu & Kashmir	10.1	8.8
Karnataka	10.0	9.2
Kerala	7.6	5.3
Madhya Pradesh	14.1	14.4
Maharashtra	9.8	9.0
Orissa	14.0	14.8
Punjab	9.4	8.4
Rajasthan	13.8	14.8
Tamil Nadu	11.5	10.1
Uttar Pradesh	16.6	19.2
West Bengal	10.7	10.7

Source: Sample Registration System, Registrar General of India.

INFANT MORTALITY BY RURAL/URBAN - INDIA AND MAJOR STATES, 1986

(Provisional)

<i>India/States</i>	<i>Rural</i>	<i>Urban</i>	<i>Combined</i>
India	105	62	96
Andhra Pradesh (8)	88	58	82
Assam (14)	111	69	109
Bihar (11)	102	65	99
Gujarat (13)	124	66	107
Haryana (9)	91	60	85
Himachal Pradesh (10)	90	41	88
Jammu & Kashmir (7)	86	58	81
Karnataka (5)	82	48	74
Kerala (1)	28	20	27
Madhya Pradesh (15)	124	81	117
Maharashtra (2)	73	44	63
Orissa (16)	127	75	123
Punjab (3)	71	55	67
Rajasthan (12)	110	69	104
Tamil Nadu (6)	93	54	80
Uttar Pradesh (17)	140	88	132
West Bengal (4)	75	54	71

Source: Sample Registration System, Registrar General of India (figure in bracket denotes the rank of the state in terms of combined IMR in ascending order).

**INFANT MORTALITY RATES BY SEX - INDIA AND
MAJOR STATES, 1984**

<i>India/States</i>	<i>Males</i>	<i>Females</i>
India	104	104
Andhra Pradesh	83	72
Assam	101	96
Bihar	94	96
Gujarat	105	106
Haryana	92	112
Himachal Pradesh	97	83
Jammu & Kashmir	73	82
Karnataka	77	70
Kerala	34	23
Madhya Pradesh	125	116
Maharashtra	77	75
Orissa	132	130
Punjab	66	67
Rajasthan	118	127
Tamil Nadu	79	77
Uttar Pradesh	150	160
West Bengal	85	78

Source: Sample Registration System, Registrar General of India.

**TRENDS IN INFANT MORTALITY RATES FOR
MAJOR STATES IN INDIA, 1981-86**

<i>State</i>	<i>1981</i>	<i>1982</i>	<i>1983</i>	<i>1984</i>	<i>1985</i>	<i>1986*</i>
India	110	105	105	104	97	96
Andhra Pradesh	85	79	77	78	83	82
Assam	106	102	94	99	111	109
Bihar	118	112	99	95	106	99
Gujarat	116	111	106	106	98	107
Haryana	101	93	91	101	85	85
Himachal Pradesh	71	68	80	90	84	88
Jammu & Kashmir	72	68	71	78	85	81
Karnataka	69	65	71	74	69	74
Kerala	37	30	33	29	31	27
Madhya Pradesh	142	134	125	121	122	117
Maharashtra	79	70	79	76	68	63
Orissa	135	132	126	131	132	123
Punjab	81	75	80	66	71	67
Rajasthan	108	97	109	122	108	104
Tamil Nadu	91	83	87	78	81	80
Uttar Pradesh	150	147	155	155	142	132
West Bengal	91	86	84	82	74	71

* Provisional estimates.

Source: Sample Registration System, Registrar General of India.

**AVERAGE ESTIMATED INFANT MORTALITY RATES - INDIA AND
MAJOR STATES, 1976-78 AND 1984-86**

<i>India/States</i>	<i>1976-78</i>	<i>1984-86</i>	<i>Index with 1976-78=100</i>
India	128.7	99.0	77
Andhra Pradesh	121.3	81.0	67
Assam	119.0	106.3	89
Gujarat	135.3	103.6	77
Haryana	111.3	90.3	81
Himachal Pradesh	109.7	87.3	80
Jammu & Kashmir	67.7	81.3	120
Karnataka	84.7	72.3	85
Kerala	48.3	29.0	60
Madhya Pradesh	143.0	120.0	84
Maharashtra	90.7	69.0	76
Orissa	135.7	128.6	95
Punjab	110.0	68.0	62
Rajasthan	141.3	111.3	79
Tamil Nadu	106.0	79.6	75
Uttar Pradesh	174.3	143.0	82

Source: Sample Registration System, Registrar General of India (Bihar and West Bengal not included, as upto 1980 the rates for these states were not available).

SELECTED INFANT MORTALITY INDICATORS -INDIA, 1976 - 84

<i>Year</i>		<i>Infant mortality rate</i>	<i>Neonatal mortality rate</i>	<i>Postnatal mortality rate</i>	<i>Prenatal mortality rate</i>	<i>Still birth rate</i>
1	2	3	4	5	6	7
1976	Rural	139	83.0	56.0	76.6	18.7
	Urban	80	49.0	31.0	43.7	11.1
	Combined	129	77.0	52.0	66.8	17.5
1977	Rural	140	88.0	52.0	69.5	16.8
	Urban	81	42.0	39.0	35.4	8.7
	Combined	130	80.2	49.8	63.7	15.5
1978	Rural	137	85.2	51.8	67.9	16.0
	Urban	74	38.0	36.0	33.5	10.3
	Combined	127	77.4	49.6	62.2	15.0
1979	Rural	129.7	77.7	52.0	63.1	13.3
	Urban	72.2	42.4	29.8	38.7	9.1
	Combined	120	71.7	48.3	59.0	12.6
1980	Rural	123.8	75.5	48.3	59.8	12.0
	Urban	65.2	39.1	26.1	35.3	7.9
	Combined	113.9	69.3	44.6	55.7	11.3
1981	Rural	119.1	75.6	43.5	58.8	11.4
	Urban	62.5	38.5	24.0	31.5	6.2
	Combined	110.4	69.9	40.5	54.6	10.6
1982	Rural	113.7	72.9	40.8	57.7	9.8
	Urban	65.2	38.8	26.4	33.1	5.2
	Combined	104.8	66.7	38.1	53.2	8.9
1983	Rural	113.8	73.6	40.2	57.7	9.4
	Urban	65.8	39.3	26.5	35.4	8.4
	Combined	104.9	67.2	37.7	53.6	9.3
1984	Rural	113.3	72.2	41.1	58.3	11.0
	Urban	66.1	39.7	26.4	35.7	7.9
	Combined	104.0	65.8	38.2	53.8	10.4

Source: Registrar General of India.

NEO - NATAL AND POST - NATAL MORTALITY

<i>Neo-natal mortality rate</i>	<i>Post-natal mortality rate</i>		
	Below 25	25-50	50-75
Below 25	Kerala	—	—
25-50	—	Maharashtra, Punjab, West Bengal	—
50-75	Andhra Pradesh, Karnataka, Tamil Nadu	Assam, Bihar, Gujarat, Haryana, Himachal Pradesh, Jammu & Kashmir Rajasthan, Madhya Pradesh	—
75-100	—	—	Orissa Uttar Pradesh

Source: Registrar General of India.

ESTIMATED DEATH RATES FOR CHILDREN AGED 0-4 YEARS BY RURAL/URBAN AND BY SEX - INDIA, 1984

<i>Sector</i>	<i>Male</i>	<i>Female</i>	<i>Person</i>
Rural	44.2	48.2	46.2
Urban	22.6	23.8	23.2
India	39.5	43.0	41.2

Source: Registrar General of India.

**TRENDS OF ESTIMATED DEATH RATE FOR CHILDREN (0-4 YEARS)
BY RURAL/URBAN AND BY SEX, 1971 - 84**

Year	Rural		Urban	
	Male	Female	Male	Female
1971	53.2	59.3	31.1	33.3
1976	54.2	55.9	29.0	30.1
1981	43.1	48.0	20.0	20.9
1982	42.2	45.7	21.2	20.5
1983	40.5	43.1	21.1	21.7
1984	44.2	48.2	22.6	23.8

Source : Registrar General of India.

GOALS FOR HEALTH AND FAMILY WELFARE PROGRAMMES

Indicator		Current level	Goals		
			1985	1990	2000
Infant mortality rate	Rural	136 (1978)	122		
	Urban	70 (1978)	60		
	Total	125 (1978)	106	87	below 60
Prenatal mortality rate		67 (1976)			30-35
Crude death rate		Around 14	12	10.4	9.0
Pre-school child (1-5 yrs) mortality rate		24 (1976-77)	20-24	15-20	10
Maternal mortality rate		4-5 (1976)	3.4	2.3	below 2.0
Life expectancy at birth (yrs.)	Male	52.6 (1976-81)	55.1	57.6	64
	Female	51.6 (1976-81)	54.3	57.1	64
Babies with birth weight below 2500 gm. (percentage)		30	25	18	10
Crude birth rate		Around 35	31	27.0	21.0
Effective couple protection rate (percentage)		223.6 (March, 1982)	37.0	42.0	60.0
Net reproduction rate (NRR)		1.48 (1981)	1.34	1.17	1.00
Growth rate (annual)		2.24 (1971-81)	1.90	1.66	1.20
Family size		4.4 (1975)	3.8		2.8
Pregnant mothers receiving ante-natal care (percentage)		40-50	50-60	60-75	100

Indicator	Current level	Goals		
		1985	1990	2000
Deliveries by trained birth attendants (percentage)	30-35	50	80	100
Immunisation status (percentage coverage)				
TT (for pregnant women)	20	60	100	100
TT (for school children).				
10 years		40	100	100
16 years	20	60	100	100
DPT (children below 3 years)	25	70	85	85
Polio (infants)	5	50	70	85
BCG (infants)	65	70	80	85
DT (new school entrants 5-6 yrs.)	20	80	85	85
Typhoid (new school entrants 5-6 yrs.)	2	70	85	85
Leprosy - percentage of disease arrested				
cases out of those detected	20	40	60	80
TB - percentage of disease arrested				
cases out of those detected	50	60	75	90
Blindness - Incidence of (percentage)	1.4	1	0.7	0.3

Appendix - III : Information Sheet on Environment*

WHAT IS THE OZONE LAYER ?

Some 15 km above the earth's surface is a mist of ozone gas. This is the 24 - km - thick *ozone layer*. Situated in the stratosphere, this layer shields the earth from the harmful ultraviolet radiation of the sun.

About 78 per cent of the atmosphere is nitrogen gas and 21 per cent is oxygen. Both these gases exist as two-atom molecules. The ultraviolet rays from the sun break up some of the oxygen molecules, releasing oxygen atoms. These atoms recombine to form a three-atom molecule of oxygen called ozone.

Ozone, being highly reactive, combines with another chemical, nitrous oxide, present in the stratosphere. Thus, in this layer, ozone is continuously created and destroyed by the sun's radiation. However, an imbalance (more destruction than creation of ozone) is created when chlorine atoms, released from the earth, react with the ozone molecules. These chlorine atoms, suspected to be released from man-made chemicals such as CFCs (chlorofluorocarbons), waft into the atmosphere. When they reach the *ozone layer*, which takes 50 to 100 years, the chlorine atoms break down the bonds holding the three atoms of ozone. The chlorine is converted into chlorine monoxide and oxygen gas is released.

This loss of ozone molecules is what is termed as *depletion of the ozone layer*. When this happens, the ozone layer's capacity to filter out the harmful ultraviolet rays from the sun decreases.

This happens especially near the poles in spring. Here the prevailing low temperature of the stratosphere makes the ozone more vulnerable to reaction with chlorine. As a result, even small amounts of chlorine which waft to these heights can cause immense damage to the *ozone layer*.

In the normal course, the nitrous oxides destroy the ozone-eater chlorine monoxide and prevent depletion of the layer. However, in the sub-zero temperature of the stratosphere above the polar regions, these nitrogen oxides freeze to form ice clouds. And chlorine monoxide accumulates. With increasing dilution of the ozone, it thins and a hole appears.

The phenomenon which has been occurring for a long time, was not known to the world till 1973. In that year, an American scientist, Dr. Sherry Rowlands and his

* *The Times of India*, (New Delhi), July 22, 1990

research associate, Dr. Mario Molina, at the University of California, discovered the ozone-eating capabilities of the chlorine atoms released from CFCs. The findings, confirmed by other studies, became public only in 1975.

As a result, aerosols, which use CFCs as a propellant, were banned in the United States and some European countries. Nothing much happened for the next 10 years and the chemical industry also gave up its plans to develop substitutes for CFCs.

CFCs, a group of synthetic chemicals, were developed in 1930 by Dr. Thomas Midgley for Du Pont-General Motors combine for their refrigeration purposes. Earlier they were using ammonia or sulphur dioxide, which were toxic and corrosive. However CFCs marketed by Du Pont under the trade name Freons, were non-toxic and inert. CFC-11 and 12 were used as coolants in refrigerators and air-conditioners, as aerosol propellants, in plastic foams found in mattresses, and fast-foods cartons. Later, CFC-113, another synthetic chemical in the same group, was found to be very useful as a solvent in the semiconductor industry.

Things were quiet on this front till 1985, when members of the British Antarctic Survey, who were making comparative measurements of ozone concentration over Antarctica, broke the bad news to the world that the layer was thinning. Environmentalists, who were already gaining currency in that period, immediately took up the issue.

Developed countries, which are the major producers and consumers of CFCs, soon swung into action. At the 1987 convention in Montreal, it was decided to reduce CFC consumption by 50 per cent by 1999. It was also agreed to freeze production of specific CFCs-11, 12, 113, 114, 115-at the 1986 level and reduce their consumption from 1993. This schedule has now been accelerated and there will be a total ban on CFC production by A.D. 2000.

However, scientists at the laboratories of chemical manufacturers searching for safe alternatives to CFCs have a major problem at hand. The substitutes under various stages of development are not as good as CFCs.

For example, one hydrochlorofluorocarbon (HCFC), called HCFC-22, which is already being used in large-scale refrigerator installations in supermarkets and other places cannot be used in domestic refrigerators. For this purpose, another hydrofluorocarbon called HFC-134a is under development. However, it will cost at least five times more than the CFCs used currently. Moreover, these chemicals also deplete the ozone layer. Therefore, substitutes will soon have to be found for them too.

In several applications, the CFC replacements will require a substantial amount of re-engineering. In domestic refrigerators, larger compressors and pumps may be

required. Above all, these substitutes may consume more energy, forcing the world to burn greater amounts of fossil fuel, leading to more global warming.

There are other related chemicals such as carbon tetrachloride (a raw material required in the production of CFCs, pesticides and paints) and methyl chloroform (used as a solvent for precision metal working and in electronics industry) which will also be phased out due to their ozone-depleting potential around A.D. 2000. So far, there are no known substitutes for these chemicals.

Appendix - IV: Research Findings on Population and Nutrition

SOME IMPORTANT RESEARCH FINDINGS ON POPULATION AND NUTRITION

There is an inverse relationship between calorie intake and family size in both urban and rural families. Daily intake is below 2000 calories per person, when the family size is between five and six, and more than 2000 calories, when the family size is smaller — between four and five.

The amount of food which a two or three year old child needs, is almost one-half of what an adult man needs. Because of the bulk, a young child has to be fed small amounts frequently — sometimes in as many as five or six eating sessions if it has to have its needs met.

Food intake and therefore nutritional status is determined by a variety of reasons: purchasing power, knowledge regarding food needs of individuals (particularly during infancy and childhood), feeding practices during health and sickness (particularly during sickness), as also food beliefs and food taboos.

The decline in the sex-ratio in India between 1 and 12 years is due to the higher mortality among female infants and pre-school children, while the fall in the ratio during the child bearing age is due to the high maternal mortality.

With increasing degree of malnutrition, age at menarche, the first menstrual period was found to be progressively increasing from 13.7 years in normal girls to 15.2 years in severely malnourished girls within a rural community.

Among women in poor socio-economic groups, whose diets are poor and who are malnourished, between 20 per cent and 30 per cent of pregnancies end in abortions and miscarriages. Among the well-nourished these are negligible. Still birth and premature deliveries are also more frequently seen among malnourished women than among the well nourished. High pregnancy wastage is thus an outcome of poor nutritional status, resulting in lower fertility rates.

In our country the mean time-interval between two pregnancies among rural women who do not resort to any family planning method, is a little over 30 months. Shortening the duration and frequency of breast feeding results in quicker restoration of fertility.

Mothers from malnourished communities deliver babies with a mean birth weight of 2.7 kg, which is 0.6 kg lower than the mean birth weight of babies delivered by mothers of well-nourished groups (3.3 kg). Prematurity and still births are much more common among malnourished mothers. Also, twice as many babies born to mothers from malnourished populations have birth weights below 2.5 kg.

If a woman weighs less than 38 kg before pregnancy, less than 42 kg during the last month of pregnancy and if she is less than 145 cm in height, the chances of her having a low birth-weight baby are very high. Close to 20 per cent of Indian rural women and women in urban slums fall into these categories.

Infant mortality rate in our country is currently around 100 — a figure which is lower than the 140 which was reported a few years ago. There is a rural-urban difference, it being always higher in the rural population. Many of the infant deaths, close to 50 per cent, occur during the first month of life (neo-natal deaths) and prematurity and low birth-weights are the most important causes.

Two out of every 100 children in the 1 to 5 year age group die. Some die because of severe frank deficiency diseases, while others die because of diseases supported by malnutrition — diarrhoea, bronchopneumonia, measles, tuberculosis and viral infections.

There is an inverse relationship between family size and nutrient intake. Among families with two adults and three children or less, the mean intake of calories and protein are higher than those of the families with two adults with four children or more. The difference in calorie intake is close to 300 and that in protein intake is about 10g per day.

Over 60 per cent of children who suffer from severe protein-energy malnutrition (which results in a high fatality rate) come from large families and their birth orders are 4 or above. Less than 40 per cent of the first three born suffer from such severe malnutrition.

If the number of children in a family is restricted to a maximum of three, almost 60 per cent of malnutrition among young children and pregnant women can be eliminated without any other effort.

Anywhere between 3 and 5 per cent of children below the age of five years living in rural India and urban slums have the serious clinical forms of protein-energy

malnutrition, and if not promptly treated, will die. Over 70 per cent of children in this age group suffer from the mild and moderate forms of the disease.

While it is true that death rates among females throughout childhood and the reproductive age of 15 to 45 years are higher than in males, National Diet Survey and Nutrition Survey data, by and large, do not show that the dietary intakes and nutritional status of girls are less satisfactory than those of boys.

Between 2 per cent and 4 per cent of children in rural areas and urban slums have signs of mild Vitamin A deficiency. It is calculated that about 30,000 children go blind every year, as a result of Vitamin A deficiency.

Anaemia occurs in people of all ages of both sexes right from infancy. Over 70 per cent of young children, 65 per cent of adult women and 45 per cent of adult men in our country have varying degrees of anaemia. Pregnant women are the worst sufferers—almost 75 per cent have the disease.

About 15 per cent of school children in some goitrous areas have varying degrees of mental underdevelopment. About the same proportion of infants have biochemical abnormalities, indicative of potential underdevelopment. Severe iodine deficiency during pregnancy results in the birth of deaf-mute infant who cannot be cured.

Appendix - V : Information Sheets on Growing Up*

THE BODY CLOCK (FEMALE)

I. Puberty - Female

1. Begins between ages of 8 to 12 and ends around age of 16 or so, and takes approximately 3-5 years to complete this stage of growth.
2. Onset of puberty is consistently 2 years earlier in girls than in boys. Girls reach full height about 2 years earlier than boys.
3. Females are born with slightly more mature skeletons and nervous systems and gradually increase this development lead throughout childhood.
4. Earlier sexual maturation of females is one reason why males are about 10 per cent taller as adults; by virtue of maturing later, males have more time to continue growing.
5. Biological changes vary in time of onset and duration, yet these changes fall into definite and predictable patterns.

II Sequence of Changes

A. *Breast budding (first change)*

1. Starts between ages of 8 and 13 (average age of 11 years).
2. Completes development between ages of 13 and 18 (average age of 15 years).
3. Psychological importance of young female (may worry about size and shape):
 - a. Not unusual for one breast to develop faster than the other.
 - b. An adolescent girl may worry about the asymmetry that results, especially if she does not know that the difference is usually corrected by the time development is completed.
 - c. Certain amount of preoccupation and self consciousness is quite common.

B. *Growth of bony pelvis (second change)*

1. Girls at birth already have a wider pelvic outlet so that the adaptation for child-bearing is present from a very early age.

UNESCO, *Sex Education - Package Two*, Bangkok, Unesco Principal Regional Office for Education in Asia and the Pacific, 1988, pp. 59-216.

2. Changes at puberty are concerned more with widening the pelvic inlet and broadening the much more noticeable hips.

C. Growth spurt (third change)

1. Females usually starts at about age of 10.5 (may begin as early as 9.5 years) and peaks at the age of 12 years.
 - a. Growth spurt usually ends around age of 14 years.
 - b. Any further noticeable growth in stature stops at the age of 18 years.
 - c. At the end of growth spurt average girl of 14 years has already reached 98 per cent of adult height.
2. First menstrual period invariably occurs after peak height velocity is passed so the tall girl can be reassured about future growth if her periods have begun.
3. Growth of legs and arms uniform :
 - a. Usually the more distal parts of the limbs (feet and hands) grow faster first.
 - b. Accounts for the gangly and awkward appearance of adolescents, for example:
foot accelerates first followed by calf and thigh;
hands, forearms, followed by upper arms.

D. Pubic hair (fourth change)

1. Begins to grow between the ages of 11 and 12 years on the average.
2. The adult pattern is established by the age of 14 years.
 - a. Kinky pubic hair appears after period of maximum growth.
 - b. This is a sign that first menstruation is approximately 6 months to 1 year away.
3. Axillary hair appears on an average, some 2 years after the beginning of pubic hair growth.

E. First menstrual period (fifth change)

1. One lingering misconception - many people think menstruation marks the beginning of puberty when actually it is one of the later events to characterize this stage of life.
2. In India average age of first menstrual period is 13.7 years, and it is gradually coming down.

3. Age-range may vary from 9 to 18 years.
4. Usually begins 2 years after start of breast development (occurs after peak of growth spurt in height).
5. First menstrual cycles may be more irregular than later ones.
6. There may be a time lag of 1 year to 18 months before process of ovulation becomes well established (however, this cannot be relied upon in the individual case).
7. Secular trend :
 - a. Successive generations have been generally getting taller and attaining puberty at progressively earlier ages.
 - b. Declining age of menarche — 4 months per decade.
 - c. In 1990, average age for first menstrual period was 14; now average age is 12.8 years.
 - d. Attributed to environmental factors - better nutrition and health.

F. Underarm hair and coarser body hair (sixth change)

The ultimate amount of body hair an individual develops seems to depend largely on heredity.

G. Oil and sweat producing glands (seventh change)

1. *Appearance of acne.*
2. *Body odour.*

H. Growth of uterus and vagina completed (eighth change)

1. Starts developing early and its growth is completed.
2. Musculature wall of the uterus becomes larger and elaborate :
 - a. To accommodate fetus during pregnancy as well as force it out during delivery.
 - b. Cyclical changes occur in its lining (endometrium).
3. Vagina becomes larger and its lining thicker.
4. Vaginal contents which are alkaline at the beginning of puberty, become acidic.
5. Ovary is a fairly complete organ at birth :

- a. Contains about half a million immature ova - each one capable of becoming a mature egg.
- b. Female is born with all of the eggs which she is going to develop - usually 400 eggs.
- c. Follicles remain immature until puberty, when ovulation begins.
- d. At puberty, follicles start maturing into eggs in monthly cycles.

THE BODY CLOCK (MALE)**I. Puberty - Male**

1. Usually begins around age 11 and 12. The sequence of pubertal maturation is predictable, but the rate at which the events occur is highly variable.
2. Onset of puberty is consistently 2 years later in boys than in girls.
3. Onset of puberty ranges from the age 9.5 to 15.
4. Girls reach full height about 2 years before boys.
5. In the year in which a boy grows faster, he normally adds 3 to 5 inches to his height.
6. An average boy of 16 has already reached 98 per cent of adult height.

II. Sequence of Changes**A. *Growth of testes and scrotum (first change)***

1. Onset of puberty is marked by the initial enlargement of the testes.
2. Growth of testes and scrotum usually begins between the ages of 10 and 13.5.
3. Development remains in progress through most of puberty and is accomplished sometime between the ages of 14.5 and 18.
4. Along with increasing growth of the testicles, reddening and wrinkling of scrotal skin.
5. Testes are the male reproductive glands that produce sperm and the male hormones:
 - a. Unlike ovaries they do not contain all the sperm they are ever going to produce.
 - b. They are a conglomerate of solid threadlike cords called 'seminiferous tubules' without sperm.
 - c. During puberty, these tubules increase in size and the cells in the lining of the tubules pass through a succession of stages to become differentiated into sperm.
 - d. From puberty on, the testes more or less continuously produce sperm generating billions in the course of an adult lifetime.
 - e. Decline in testicular function is far more gradual than ovaries in terms of both sperm and hormone production.

B. Straight pubic hairs (second change)

1. Usually an early event of puberty.
2. Occurs between the ages of 10 and 15 years.
3. Prepubescent boy may have some finely textured hair but no true pubic hair.
4. Long strands of slightly curly hair then appear at the base of the penis.
5. Pubic hair becomes darker, coarser and more curly, as it spreads over the scrotum and higher up the abdomen.
6. Straight pubic hair appears before first ejaculation, but becomes kinky after this milestone is reached.

C. First ejaculation (third change)

1. Usually occurs about a year after testicular growth.
2. Average age for first ejaculation is 14.6 years.

D. Growth spurt - arms, legs, penis (fourth change)

1. Beginning of penis growth spurt occurs normally between the age of 10.5 and 14.5 years (average age 12.5 years).
 - a. Age for completion range from 12.5 to 16.5 years (average age 14.5 years).
 - b. Late developer may begin to wonder whether he will ever develop his body properly or be as well endowed sexually as those whom he has seen developing around him (needs support and reassurance).
2. Height spurt occurs relatively later in boys than in girls (between ages of 11 and 13 girls tend to be taller and heavier).
3. Average age of height increase is 14 years.
4. Short statured male whose genitalia are just beginning to develop can be reassured that an acceleration in height is soon to take place.
5. In the year in which a boy grows the fastest, he normally adds about 3 to 5 inches to his height.
6. Leg length as a rule reaches its peak first.
7. The spurt in trunk length follows almost a year later.
8. Leg growth itself not uniform (foot accelerates first, followed by calf and thigh, more distal parts of the limbs grow faster first).

E. Voice change - growth of larynx (fifth change)

1. Deepening of the voice results from the enlargement of the larynx.
2. Occurs relatively late in adolescence - often a gradual process.
3. **Voice changes - two stages :**
 - a. Some early voice changes occur prior to the first ejaculation.
 - b. Deep tonal transition comes after the appearance of axillary hair and the **period of maximum growth.**

F. Underarm and coarser body hair (sixth change)

1. Generally appears a couple of years after the growth of pubic hair.
2. Accompanied by increased body hair and facial hair.

G. Oil and sweat glands activated (seventh change)

1. **Body odour.**
2. **Appearance of acne :**
 - a. Common concern for many adolescents.
 - b. Increased production of androgen hormones accompanying puberty in both sexes leads to an increase in skin thickness and stimulates the growth of sebaceous glands (small glands in the skin which produce oil).
 - c. Often these small glands grow more rapidly than do their ducts to the surface - resulting in clogged pores, inflammation, and infection with the appearance of blackheads and pimples.

III Facial hair - beard (eighth change)

1. Important event because of its social implications as a symbol of manhood.
2. Facial hair begins to grow at about the time when the axillary hair appears
3. Definite order in which the hairs of moustache and beard appear
 - a. First facial hair grows at the corners of the upper lip.
 - b. Then it spreads to form a mustache over the entire upper lip.
 - c. Upper part of the cheeks and the area under the lower lip.
 - d. It eventually spreads to the sides and lower border of the chin and the rest of the lower face.

EMOTIONAL CHANGES FOR BOTH BOYS AND GIRLS***A. Increased production of hormones prompting sexual thoughts and daydreams in most of the young people - a heightened awareness of sexual attraction :***

1. Release of semen by boys during sleep, called nocturnal emission or 'wet dreams,' is common at this age.
2. Both boys and girls may experience sexual excitement from simply watching or being near someone they are attracted to. They may not understand that the emotions they are feeling are sexual in nature.
3. Sexual fantasies are common at this age.
 - a. Some parents feel that this is a natural stage of development and not a matter of concern.
 - b. Other parents feel that some daydreams or fantasies are not wrong but others are; and like various facets of human behaviour, some fantasies need to be controlled.
4. In general, boys and girls become more interested in each other during puberty.
5. While sexual interest and thoughts are common, it is also quite normal not to be sexually concerned, especially in the early years of puberty.

B. Puberty - a time of great shifts of moods for most people

- 1 Discomfort and concern about the changes in their bodies and feelings may cause emotional stress.
- 2 Moods shift quickly and unpredictably
- 3 Crying over seemingly small matters is common for both boys and girls and is not something to be ashamed of.
- 4 It helps young people to share their concerns with parents or friends. Often, it is surprising and comforting to discover that others share similar concerns and feelings.

C. Increased feelings of independence-a part of the normal development in adolescence:

1. There are shifts between mature behaviour and childish behaviour
2. Relationships with parents begin to change, as young people assert their independence, sometimes causing difficulties

DEVELOPMENTAL TASKS

Independence: Adolescents need to become less dependent on parents. They begin to shift from parents to peers or to belief systems in order to achieve independence. This shift is strong and may involve rebellion.

Identity: Adolescents struggle to define themselves and what they want to accomplish. They are answering the questions: 'Who am I? What can I be?' This process involves experimenting. Adolescents need to develop gender role identity, a positive body image, and a sense of esteem and competence.

Intimacy: This is a time of preparation for loving relationships. Adolescents are learning to express and manage emotions. They are developing the capacity to love and be loved, and to be intimate in relationships with others.

Integrity: Adolescents must develop a foundation for sorting out values. Parents should provide a base for this. However, there is a tremendous amount of other input at this time—peers, media, school, etc. Adolescents are deciding what to believe in and how to behave.

Intellect: The adolescent's intellectual capacity is increasing and changing from concrete thinking to include abstract thinking. Many adolescents become capable of conceptual thinking and of understanding logic and deductive reasoning. This increased ability may heighten self esteem. Some adolescents tend to overvalue their intellectual theories and see things from an idealistic point of view.

DEVELOPMENTAL STAGES

These are normal tendencies but do not necessarily describe a particular child. These stages overlap.

- Early:** Onset of puberty, female ages 10-13, male ages 11-14 :
Starting to move to peers;
Vacillates between clinging and rebellion;
Strives for independence;
May be confused, preoccupied with body, wonders 'Am I normal?'
May experiment with same-sex sexual behaviour;
Begins to think abstractly.
- Middle:** Onset of puberty, female ages 13-16, male ages 14-17 :
Continues effort to establish separate identity from parents;
Often becomes idealistic and altruistic;

- Interested in exploring sex;
 - Loves intensely;
 - Continues to develop abstract thinking;
- Late:
- Onset of puberty, female age 16-?, male ages 17-?
 - Many secure emancipation by now;
 - Establishes set body image;
 - Loves more realistically with commitment and giving;
 - Peer group becomes less important, more selective;
 - Develops more consistent framework of values, morals, ethics;
 - Able to think abstractly;
 - Defining life goals;

PREGNANCY

CONCEPTION AND ESSENTIAL NEEDS DURING PREGNANCY

Introduction

Conception is the beginning of a new life resulting from the meeting of a sperm and an ovum. On conception women experience the common signs and symptoms of pregnancy which may vary and occur earlier or later in different women.

Signs and symptoms of pregnancy

These include:

- | | |
|-----------------|---|
| Early | Amenorrhoea = menstruation stops.
Nausea = a feeling of wanting to throw up, commonly experienced on getting up or even in the evening. |
| Mid Term | Frequent micturition = urinating frequently.
Enlargement of the breasts with darkening of the nipples.
Enlargement of the abdomen; and uterus is palpable = (can feel the uterus).
Quickening = foetal movements felt.
Breast changes are more pronounced and secretion of milk (build up of colostrum) is present. |
| Late | Uterus is very much increased in size and foetal parts and movements felt.
Foetus becomes viable, that is, capable of an independent existence. |

Importance of antenatal care

The average duration of human pregnancy is 280 days or 40 weeks or 9 calendar months and a week. Pregnancy is a natural phenomenon and majority of expectant mothers would experience good health and promote the healthy growth of the foetus if she would have adequate antenatal care provided at the various clinics, urban or rural, government or private. Antenatal care is an important part of the total care of the pregnant women; and the services provide:

Guidance and health supervision;

- Ensuring a normal delivery;
- Learning the art of child care;
- Motivating for family spacing;
- Encouraging family life development.

a. Regular attendance at antenatal clinic

It is important for mothers to attend the antenatal clinic on a regular basis so as to receive quality care and maintain optimum health of herself and her unborn baby. The normal pregnant mother should visit the clinic at least about eight times during her current pregnancy so as to have continuous health care and medical supervision.

b. Recommended frequency of visit

First clinic attendance at about 12 weeks; followed by 6 weeks interval to 30 weeks; followed by fortnightly visits to 40 weeks.

c. Mothers at risk

Frequency of clinic visits by high risk mothers depends on the condition of each individual mother and the decision of her physician.

Essential needs during pregnancy

a. Nutrition : Balanced diet

An adequate well-balanced diet is essential for health. In pregnancy it is of particular importance to maintain the health of the mother and also to provide food for the growing baby. Intake of nutritious food, the right amount of each kind of food, during pregnancy will also help promote a successful lactation which is the ideal food for the baby. It has now been established that breast-feeding helps to lay the foundation of sound emotional health of the child.

The daily diet should consist of balanced meals containing the following:

Body-building food such as fish, meat, eggs, milk and pulses such as green peas, lentils, red beans, peanuts, soyabeans, etc.

Energy giving food such as rice, potatoes, breads; and
Some fats, oil, butter, cereals; etc.

Body protecting food such as green leafy vegetables, beans, tomatoes, carrots, cabbage and a variety of local fruits such as papaya, mangoes, guavas, etc.

When a woman needs special dietary care during pregnancy the family members should cut out less essential spending to ensure adequate supply of food.

b. Exercise

Exercise during pregnancy helps stimulate circulation, maintain good posture, strengthen the muscle and increase the ability to relax. Most women get a certain amount of exercise while doing housework. The kind and amount of exercise a mother needs depends on the type of work she does.

Manual workers who do heavy work should actually lighten their load of work as pregnancy advances.

Housewives may need moderate exercise particularly in the open air. Walking or gardening is beneficial.

Sedentary workers who have very little exercise should do specific exercise daily.

c. Rest, relaxation & sleep

Extra rest is necessary and relaxation needs practice. Relaxation is a way of conditioning the muscles, to loosen up and help to release tension. The mother should take every opportunity to rest and learn to relax. She could do this by lying on a mat or a firm mattress, close her eyes, screw them up tightly, then relax, followed by the neck, trunk and limbs in like manner. Once the mother has learnt the art of relaxing completely, she will probably fall asleep afterwards. The expectant mother should aim at 8 hours of sleep at night and needs at least an hour of rest during the day.

d. Emotional support

Certain emotional changes may occur in pregnancy which need to be understood by the expectant mother and her family. The individual personality will influence to a marked degree the exact pattern of emotional change in pregnancy. The general excitable temperament may be increased during pregnancy, whereas the woman of slow equable temperament may become quite vivacious. Even the placid woman may become irritable, uneasy and anxious. The husband should understand the moods and give her the support and assurance. When there are social and economic pressure and perhaps the baby was not planned, the mother may experience feelings of rejection and depression. Loving kindness by the family may help to overcome this stressful period. Each family member could contribute in one way or the other towards the well being of the mother and the new arrival. Planning and sharing the experience will draw the family close together. The midwife and the physician may also play a supportive role to maintain the emotional health of the expectant mother.

SELF — ESTEEM

Self-esteem is closely identified with self-respect. It includes a proper regard for oneself as a human being and an accurate sense of one's personal place within the larger society of family, friends, associates, and others. In the extreme, self-esteem can degenerate into conceit, while a lack of it can result in a sense of unworthiness. The key is the balance. Too much focus on self leads to the inflation of conceit blocking the experience of cooperative relationships. A deficient sense of self, renders one unable to interact freely and responsibly with others in home, school, work place and society.

Parents and teachers have the greatest influence on children's self-esteem in day-to-day inter actions and relationships. Children's experience of feeling of being capable and lovable during the early years forms their self-concept and self-esteem. Harris Clemes and Reynold Bean have defined the following four conditions that must be fulfilled for a high sense of self-esteem to be developed and maintained. Children must have a steady sense of...

Connectiveness, that results when a child gains satisfaction from associations that are significant to the child; and the importance of these associations has been affirmed by others.

Uniqueness, that occurs when a child can acknowledge and respect the qualities or attributes that make him/her special and different, and receives respect and approval from others for these qualities.

Power, that comes about through having the resources, opportunity, and capability to influence the circumstances of his/her own life in important ways.

Models, that reflect a child's ability to refer to adequate human, philosophical, and operational examples that serve to help him/her establish meaningful values, goals, ideals and personal standards.

It is important for a student's self-esteem that the school provides experiences that satisfy these four conditions every day, and learning itself becomes self-enhancing. Most important are successful relationships with peers and teachers and the satisfaction of academic achievement. In the school, therefore, the learning experiences should be specifically designed to build self-esteem while providing cognitive learning.

The importance of positive self-regard should not be minimized or given only token acknowledgement. Self-esteem is the foundation upon which personal and

social development is balanced. Indeed, to a considerable degree, personal success can be measured in terms of how well one has succeeded in constructing an accurate model of himself/herself in relation to others.

While a person's sense of self is ever changing, reflecting the flux of events both internal and external, students at the upper primary level are at a crucial period of development – a period of life when the self-images of early childhood broaden out into the more encompassing visions of adolescence. The child's personal experience of the world expands, taking in ever-widening spheres of interest and accomplishment. Self-understanding in relation to others, the development of a positive and accurate sense of self, can have immense significance. It affects one's sense of personal success within the family, at the school, and elsewhere.

SELF CONCEPT

Self-concept can be defined as a person's perception of himself. This includes his perception of his abilities, character, attitudes, traits, appearance, aims and deeds. Other terms such as self-image, self-evaluation, self-esteem are used in lieu of self-concept.

Self-concept is described as the directing force in human behaviour because a person acts consistent to his/ her self-concept. In other words, what a person thinks or how he behaves is determined largely by the concept he holds about himself. A person who is confident and has high regard for himself behaves differently from another person, who feels incompetent, inferior and insecure. Similarly, a person who feels competent in one situation behaves differently in another, where he feels incompetent and insecure. His behaviour can further reinforce his perception of himself. A person who perceives himself as a poor reader makes so many mistakes when asked to read. Therefore, his self-image as a poor reader is reinforced. Often we are afraid to try because we feel we are not good enough.

A person perceives, interprets, accepts, rejects or resists what he encounters in accordance with his self - image. His behaviour may appear irrational to observers but to the person they are consistent to the stimuli as perceived by him. To the observers a headmaster's authoritarian behaviour in school is contradictory to his submissive behaviour at home. But to the headmaster his behaviour is consistent with his perception of his roles. Just as he expects the teachers and students under his supervision or his domain to adhere to his rules and regulations, he expects similar behaviour from himself at home which is his wife's domain.

Our self-concept is formed through interactions with the people. From the way others react towards us and the appraisals they make of our efforts, we form concepts of who we are and what we are capable of achieving. Consequently, the reactions of the people, especially of those who are significant to us, will influence the formation of our self-concept.

SEXUALLY TRANSMITTED DISEASES

I. Introduction

A. Definition

1. Sexually transmitted diseases (STDs) are those which usually are contacted through sexual relations.
2. STDs affect the sexual organs and can seriously affect other organs.
3. Gonorrhea and syphilis are the most common. AIDS, however, is the most fatal, as no cure for it has been discovered as yet.
4. Sexually transmitted diseases are also known as venereal diseases.

B. Epidemic proportions of STDs

1. Syphilis and gonorrhea combined together have the highest incidence of any reportable communicable disease. However, the actual number of cases is estimated to be three to five times the number of reported cases. In much the same way, by 1986, 29,000 cases of AIDS have been discovered in 71 countries around the world but WHO estimates that the actual number of cases may be as high as 100,000.
2. Herpes II, known to be occurring at an alarming rate, is not a disease which is reported to health departments, therefore, no exact account is available to document the incidence.

C. Uncertainty of the actual number of cases of STDs

1. One reason for the lack of information is that some doctors are hesitant to report cases to the Health Department.
2. Many people have an STD, but have no symptoms.
3. People are often afraid, and ashamed of seeking help in the clinic.

D. STDs : a social as well as a medical problem

1. There is still a lot of social stigma attached to STDs.
2. In the past it was difficult to get treatment without harassment; however this is gradually changing.

E. Vaccines against STDs

1. There is no vaccines available for syphilis or gonorrhea.
2. The diseases do not cause the body to produce antibodies to prevent reinfection.
3. It is possible to get STDs again and again; and in the case of Herpes, the infection never leaves the body.

II. The history of STDs

1. Historical writings indicate that STDs have been a health problem since ancient times.
2. STDs are referred to in the Old Testament and ancient Indian literature.
3. Hippocrates described syphilis-like sores in 460 B.C.
4. One theory of the origin of syphilis in Europe is that Columbus and his crew returned from the New World with syphilis; Columbus himself died of an advanced case of syphilis.

III. Gonorrhea

A. Gonorrhea : the most common sexually transmitted disease

1. The bacteria which causes gonorrhea was discovered in 1870. It is called the gonococcus of Neiser, after the scientist who first discovered it.
2. Gonococci can only penetrate certain types of cells in the human body. These cells are found in the cervix, urethra, rectum, the lining of the eyelids, the throat and the vagina of young girl.
3. The bacteria can live only a short time outside a warm, moist environment. However, they can live outside the body in pus for about an hour. It is feasible, but rare, to catch gonorrhea from contaminated towels, underwear and toilet seats.
4. Gonococci can live for years inside the human body.

B. Symptoms of gonorrheal infection

1. 80 per cent of women and 40 per cent of men with gonorrhea are symptomatic they show no symptoms.
2. For those who do exhibit symptoms, the most common is pain or burning sensation while urinating; this is especially true of males.

- 3 Several days following exposure, there may be a discharge from the cervix, penis or anus, or a sore throat. This discharge goes away by itself after several weeks but the disease remains, moving deeper into the reproductive system.
- 4 At this stage a woman may experience pain on one or both sides of her abdomen. She may have fever, nausea and vomiting and may have irregular periods.
- 5 In men, an abscess may develop in the prostate gland. Gonococci may then be ejaculated along with the sperm during intercourse.

C Long-term effects of gonorrhea

- 1 Gonorrhea usually does not result in death but the effects may be very serious.
- 2 In males, untreated gonorrhea may lead to sterility due to scar tissue blocking the passage of sperm. Heart disease or gonorrheal arthritis may develop from the invasion of tissue by gonococci.
- 3 In females, untreated gonorrhea may lead to partial or complete blockage of the fallopian tubes by scar tissue.
 - a Partial blockage can result in ectopic pregnancy. This occurs when the sperm fertilizes the egg and instead of traveling down to the uterus to grow, the egg gets stuck and implants itself in the fallopian tube. If not diagnosed early, the tube can rupture causing a severe infection and sometimes death.
 - b Complete blockage of the tubes results in sterility, as the sperm cannot make their way to the egg.
- 4 As in males, gonorrhea in women also can cause heart disease or arthritis.
- 5 Pelvic Inflammatory Disease (PID) is another possible result of gonorrhea in women. This is a serious condition which affects the pelvic area containing the reproductive organs. PID is treated with antibiotics. It is rarely necessary to remove the affected sexual organs to cure the disease.
 - a Intrauterine devices (IUDs) increase the possibility of developing PID. They also make treatment more difficult for unknown reasons.
 - b Birth control pills create a hormonal environment in the body which encourages the spread of gonorrhea.

D Testing and diagnosis of gonorrhea

- 1 Diagnosis of gonorrhea is determined by taking a history of sexual activity.

from the patient and by demonstration of gonococci from smears or cultures of urethral, cervical, throat or rectal discharge.

2. A culture involves swabbing the discharge and placing it on a special culture plate. This is incubated for 16 to 48 hours. The culture then is examined for the presence of the gonococcus. Smears also are taken, which are stained and **examined for the organism.**

1. Pregnancy and gonorrhea

1. Mothers inflicted with gonorrhea can pass it on to their babies during or after birth.
2. The eyes of the newborn are extremely susceptible. Infection can cause blindness. Because of this, it is required that special eye drops of silver nitrate **be administered at birth.**

1. Resistance to penicillin

1. In general the gonorrhea organism has become less sensitive to penicillin. Since World War II, the dosage of penicillin necessary to cure uncomplicated gonorrhea has increased eight-fold.
2. Recently, there have been cases in which the gonorrhea organism has been capable of producing a substance which makes penicillin ineffective against the organism. In these cases, other antibiotics must be used.

IV. Syphilis

A. Syphilis—less common but more dangerous than gonorrhea

1. Syphilis is caused by a spiral shaped organism called *treponema pallidum*.
2. It was discovered in 1906 by Schaudin and Hoffman. In the same year, Wassermann developed a blood test to detect syphilis.
3. Syphilis has been responsible for countless deaths and terrible suffering **throughout history.**

B. Four stages of infection with different symptoms and consequences

1. Primary stage:

- a. The first sign of syphilis is usually an open sore, called a chancre, which appears three to four weeks after exposure. This sore most often occurs near the place where the spirochete enters the body.

- b. Chancres can form on the genitals, lips, fingertips, anus or mouth.
- c. Many women never know that they have a chancre, because it forms on the cervix or inside the vagina or rectum.
- d. Chancres are painless and disappear by themselves in one to five weeks.
- e. The primary stage is very infectious. The chancre is loaded with spirochetes. These can enter the body through the pores of the skin. Transfer usually takes place during *sexual* contact, but at this stage it can occur in whichever way the physical contact is made (kissing, touching, etc.)

2. Second stage :

- a. In this stage the organisms enter the circulatory and lymphatic systems of the body.
- b. This occurs anywhere from zero to six months after the disappearance of the chancre.
- c. Many kinds of symptoms are possible at this stage, because the whole body is affected.
- d. Symptoms may include a rash, often visible on the palms of the hands and bottoms of the feet, chancre-like sores on the body, painful swollen joints, hair loss, flu-like symptoms.
- e. At this stage syphilis can spread by simple physical contact such as kissing.
- f. The symptoms of this stage disappear by themselves. The disease, however, remains still very active.

3. Latent stage :

- a. This stage lasts three to twenty years.
- b. There are no visible symptoms.
- c. During this stage the spirochetes enter the internal organs such as the heart and brain.
- d. During this stage syphilis is no longer infectious.

4. Late stage :

- a. This is the stage where the permanent damage to the body becomes apparent.
- b. Heart disease, crippling, blindness and insanity are possible long-term effects of syphilis.

C. Diagnosis of syphilis

1. There are several blood tests for syphilis, but none are 100 per cent accurate.
2. Some tests can determine whether a person has had syphilis, but cannot indicate that the patient has been cured.
3. The procedure used to determine whether a patient has syphilis is as follows :
 - a. A history is taken to find out if the patient has been exposed to syphilis.
 - b. The patient is examined for visible symptoms.
 - c. A microscopic examination of material from a lesion is done to check for spirochetes.
 - d. Blood tests are done.
 - e. Other tests such as examination of spinal fluid may be necessary in latent, late or newborn cases.

D. Syphilis and pregnancy

1. Syphilis is transferred from mother to foetus during pregnancy.
2. Syphilis can cause deformity, blindness or death of the baby, if the mother goes untreated.
3. If a woman is treated before the 16th week of pregnancy, the foetus probably would not be affected but will require close follow-up by health professionals.
4. All pregnant women should have a test for syphilis as soon as they know they are pregnant.

V. Herpes Simplex, Type II*A. Herpes II : viral infection related to Herpes I causing the common cold sore*

1. Herpes II usually occurs below the waist on or around the genitals.
2. How Herpes is contracted is unknown at this point.
3. The true incidence of Herpes is not known as it is not a disease which is reported to health departments. It is known to be increasing at an alarming rate.
4. Research indicates that Herpes may increase a woman's risk of getting cervical cancer.

B. Symptoms

1. Multiple blister-like sores appear inside the vagina, on the external genitals, on the thighs, near the anus or on the penis.
2. These blisters rupture and become painful open sores.
3. These open sores are believed to be very infectious.
4. The symptoms run their course and eventually disappear by themselves, but the virus remains in the skin in a 'dormant' form.
5. Herpes can recur at any time. It seems most likely to come back when the body's resistance is lowered due to stress, poor diets, fatigue, etc. In some people Herpes recurs on a cyclical basis, as during the menstrual period.
6. The clinician can diagnose herpes either by the appearance of the sores or by a microscopic examination of a smear taken from a sore.

D. Herpes and pregnancy

1. Herpes may cause a pregnant woman to deliver early or miscarry.
2. If a baby contracts Herpes during delivery through the birth canal, it may suffer severe illness or death.
3. It is thought that this can occur, if the mother has an active case of Herpes II at the time of delivery.
4. Mothers with active Herpes II at the time of delivery undergo cesarian operation to prevent the possibilities of the newborn becoming infected as it passes through the (infected) birth canal.

E. Prevention of Herpes

1. If condoms prevent contact with Herpes sore, they can help prevent contraction of the virus.
2. If a case is active, sex should be avoided.
3. People should stay in good physical condition eating well, getting plenty of rest and doing exercise.
4. Women who have Herpes should have a Pap Test every six to twelve months.

VI. AIDS

A. *AIDS : Acquired Immune Deficiency Syndrome*

1. AIDS is caused by a virus called HIV (Human Immunodeficiency Virus). HIV damages the body's immune system, making it unable to fight off infections and cancers.
2. The human blood consists of white blood cells or lymphocytes which come in B cells and T cells. Some T cells are called helper cells, while others are called suppressor cells. The helper cells help the B cells produce antibodies that fight disease-carrying organisms. On the other hand, the suppressor cells work to stop or suppress this fight against invading germs. In people with AIDS, the suppressor cells outnumber the helper cells, rendering the immune system weak or ineffective in the fight against diseases.
3. Until August 1986, about 29,000 cases have been reported in 71 countries around the world; and the World Health Organization estimates that the actual number of cases may be as high as 100,000. In addition to cases of AIDS, five to ten million people may be infected with HIV, the virus that causes AIDS.
4. AIDS is a fatal disease that cannot be cured.
5. AIDS is spread by sexual intercourse, by contaminated blood and by contaminated hypodermic needles.
6. AIDS is not spread by casual contact.

B. *Symptoms of AIDS*

1. It can take from 6 months to 8 years for a person who has been exposed to AIDS, to develop the disease.
2. Some people exposed to AIDS never get it themselves, but become 'carriers'. Although carriers appear healthy, they can give AIDS to a sexual partner or to someone they share a needle with.
3. Many of the symptoms of AIDS are also symptoms of minor illness like cold or flu, but in AIDS these symptoms either don't go away or keep coming back.
4. These symptoms include:
 - a. Unexplained weight loss is greater than 10 pounds
 - b. Recurring fever and/or night sweats
 - c. Unexplained fatigue

- d. Diarrhea
- e. Swollen glands usually in the neck, armpits or groins
- f. Unexplained dry cough
- g. White spots or unusual blemishes on the tongue or mouth
- h. Pink or purple blotches or bumps on or under the skin, inside the mouth, nose, eyelids or rectum. The bumps may look like bruises but they don't go away.

C. *Effect of AIDS*

- 1. Many people carrying AIDS virus look and feel perfectly well for a long period. They may go on indefinitely this way. Some will develop a milder form of AIDS called ARC (AIDS related complex). ARC can include any symptom of AIDS or it may turn into 'full blown' AIDS.
- 2. AIDS is a fatal disease. In the U.S. about 50 per cent of patients die within 18 months of diagnosis and about 80 per cent, within 36 months. Less than 10 per cent of persons with AIDS have survived longer than three years.
- 3. Many times, it is not the virus itself which kills the person but the infection or cancer that develops.
- 4. The number one cause of death of persons with AIDS is *Pneumocystis carinii* pneumonia (PCP), an infection of the lungs.
- 5. Of the cancers, Kaposi's Sarcoma (KS) is the most common. It is a cancer of the tissues beneath the skin. It can also affect the lymph nodes and internal organs.
- 6. New evidence shows that HIV may also attack the nervous system, causing damage to the brain and spinal cord. Signs of damage may include memory loss, indifference, inability to make decisions, partial paralysis, loss of coordination and other problems in controlling the body.

D. *Testing and diagnosis of AIDS*

- 1. Current screening tests do not diagnose AIDS. They detect antibodies to HIV in the blood. It just shows if a person has ever been infected by the virus. It does not indicate that a person has or will get AIDS.
- 2. The ELISA is the easiest, cheapest and most widely used test. It is an enzyme-linked immunosorbent assay which was originally developed to screen donated blood.

3. In ELISA, a special electronic instrument measures colour changes in serum when antibodies are exposed to pieces of HIV.
4. While ELISA is very sensitive - that is, it identifies almost all blood containing antibodies to HIV, the test is not so specific and sometimes produces false positive.
5. Research is underway to develop more accurate and less expensive tests.

E. How AIDS are transmitted

1. AIDS is spread by the exchange of body fluids, especially blood and semen. Sexual transmission is a known means of infection.
2. Another way of getting AIDS is by using contaminated hypodermic needles. Blood containing the virus may be left on the needle used by an AIDS person and passed on to the next user.
3. An infected woman can give AIDS to her child during pregnancy. AIDS is thought to be transmitted from mother to infant in the womb, at birth, directly after birth through close contact or possibly while breastfeeding.
4. Homosexual and bi-sexual men, who have many sexual partners who have been infected with AIDS, are considered high-risk groups.
5. About 3 per cent of those people and hemophiliacs who have had blood transfusions, have contracted AIDS.

F. Prevention of AIDS

1. Avoid having sex with persons known or suspected having AIDS.
2. Limit the number of sex partners.
3. Know sex partners and ask them about their health.
4. Avoid sexual practices that can damage body tissues (i.e., anal intercourse)
5. Do not inject illegal drugs. If you do use drugs, do not share needles.
6. Do not have sex with persons who inject drugs.
7. Always use condoms.
8. Other public health measures have been suggested such as:
 - a. isolating infected persons;
 - b. restricting their travel and immigration;
 - c. providing sterile needles to intravenous drug users;

- d. screening all donated blood for HIV antibodies and discard any seropositive blood.
9. Other body fluids like saliva and tears have not been shown to spread the disease.
10. Casual contact has not been shown to spread HIV. To transmit the virus, infected cells or viral particles must pass into the tissue or bloodstream of another person.

VII. Other Sexually transmitted diseases

A. *Venereal warts (condylomata accuminata)*

1. These are caused by a virus.
2. They resemble regular warts but appear on the genitals.
3. Warts appear one to three months after contact.
4. Venereal warts are painless, but they spread easily by sexual contact.
5. The warts are treated with an application of a liquid chemical called podophyllin. This liquid dries the warts. It must be washed off after two to six hours of application.
6. All warts must be treated simultaneously or they will spread again.
7. Condoms help prevent the spread of venereal warts.

B. *Lice and 'crabs' (pediculosis)*

1. Lice are tiny insects which cling to the base of hairs on the head, body and pubic area. They feed on blood.
2. 'Crab' lice are the type found in the pubic area. They may be seen upon careful inspection. The adults appear as a small insect which can frequently be seen moving, the 'moving mole'. The eggs are tiny and are attached to the base of the pubic hair.
3. Crabs usually cause severe itching and reproduce quickly.
4. They cannot be washed off. Special lotions or shampoos such as Kwell, A-200 and Cuprex are used for getting rid of crabs. Some of these are available without prescription in drugstores.
5. Crabs can be acquired from another infected person, from bedding, clothing or toilet seats.

C. Scabies

1. Scabies is caused by infestation with a parasite/sarcoptes scabies.
2. It is characterized by an itchy rash most usually between the fingers, on the wrists, the genitalia or the buttocks.
3. Scabies spreads through close physical contact, not necessarily sexual intercourse.
4. Itching generally starts four to six weeks after contact.
5. Scabies is treated with a cream or lotion similar to those used for crabs. These medicines require a prescription.
6. As with lice, treatment also consists of disinfection of bedding and clothing.

D. Molluscum Contagiosum

1. This is a viral infection of the skin, generally involving the genital area, the thighs, lower abdomen and other areas.
2. It appears as a small, white swelling, with a 'dimple' in the middle, which occurs in groups.
3. There are few, if any, symptoms.
4. Treatment consists of extruding the center or with administration of phenol. Treatment should be performed by a health professional.

E. Vaginitis

1. Vaginitis is a condition of local irritation of the vaginal wall and cervix caused by one of several different organisms. Only some of these organisms are known to be sexually transmitted.
2. Symptoms generally include vaginal discharge and irritation (itch, pain, discomfort).
3. Diagnosis is made by a smear of the vaginal (or cervical) discharge or by culture.
4. The most common organisms which cause vaginitis are candida albican (a yeast), trichomonas (a parasite) and corynebacterium vaginale (a bacteria). These infections generally respond well to adequate therapy.
5. Of the above organisms, only trichomonas infections require concurrent therapy of both the sexual partners. Sometimes the male is treated for corynebacterium infection as well.

1. Gonorrhoea (gonorrhea) or 'neisseria' (NGU or NGC)

- 1 This is a condition of males characterized by painful discharge and sometimes by burning on urination or an itching sensation.
- 2 Diagnosis is given only if exclusion of the smear and culture for gonorrhoea are both negative.
- 3 Causes include infection with chlamydia trachomatis (an organism between a virus and a bacterial), mycoplasma (a bacterial) and others.
- 4 NGU or NGC which follows adequate treatment for gonorrhoea is termed post-gonococcal urethritis (PGU). The cause for this is unknown but is thought to be an infection acquired at the same time as gonorrhoea but having a longer incubation period (period between infection and onset of symptoms).
- 5 Non-gonococcal urethritis also may be acquired from a sexual partner with vaginal vaginitis.
- 6 The above infections can generally be treated with adequate doses of an appropriate antibiotic.

2. The 'tropical' STDs

- 1 The group includes syphilis, yaws, venereal granuloma inguinale and chancroid.
- 2 These diseases occur most frequently in the tropics and subtropics.

3. New additions to the STD list

- 1 All sexual partners (except venereal diseases) which are transmitted through sexual intercourse.
- 2 The spread of oral sex is increasing and so are the rates of some of the diseases which enter the body through the mouth. These diseases are liver and intestinal infections, formerly thought to spread through food infected by human excreta or through needles.
- 3 These diseases include typhoid fever, shigellosis and amoebic dysentery and hepatitis (both infectious and serum).
- 4 The intestinal infections are most easily transmitted through oral-anal or oral-oral contact.
- 5 Treatment for some of these diseases is lacking. Some of these diseases have a latent state with no outward appearance of disease, thus, there is no way to tell if a person has it.

VIII. Prevention

4. *Resisting sexual activities*: the epidemic spread of sexually transmitted diseases is caused due to increasing numbers of persons having multiple sexual partners.
10. *The use of the natural barriers*: condoms prevent skin to skin contact and are thus helpful in preventing the transmission of some of the diseases.

c. Local agents

1. Some of the contraceptive and vaginal creams, foams and pills help reduce the chance of acquiring a STD. Some are proven effective, and there is no reliable information on dosage and timing of application.
 2. Washing with soap and water before and after sex is an important deterrent to the spread of STD.
 3. Urinating after sex cleans the urethra.
 10. *Prophylactic antibiotics*: this route has been disappointing. There is no 'morning after pill'.
 11. *Vaccination*: Again, there are no vaccines against the STDs. In some cases, few cases (e.g. hepatitis B) having a STD gives natural immunity, thus one can catch them again and again.
- #### 1. Change in attitude
1. *Delaying sexual activity education*: is one of the current 'mad' thoughts. The contemporary ideas and goals that are associated with the STDs lead to delays in treatment, delays in notifying partners and spread of disease.
 2. If people are less willing to report and acceptance of STDs weakens early diagnosis and treatment, which has negative effect on the search for treatment and hence from not notifying their sexual partners. If people are less willing to report, it will stop the spread of STDs.



BIBLIOGRAPHY



BIBLIOGRAPHY

POPULATION EDUCATION : EDUCATIONAL INNOVATION

Benoza Hortensia S. and Remedios M Cayari, *Population Education : A Multi-Sectoral Concern*, Manila, Population Education Program, Ministry of Education and Culture, 1974.

Bhende, Asha A., and Tara Kanitkar, *Principles of Population Studies*, (2nd ed.), Bombay, Himalaya Publishing House, 1982

Brown, Lester R., et al., *Twenty-two Dimensions of Population Problem*, Washington, D C., Worldwatch Institute, 1976

Cruz, Leonardo de la, *Survey of Research Relevant to Population Education in Philippines*, Quezon City, College of Education, University of Philippines, 1974

-. "Population Education - Nature, Goal and Role," Bangkok, Unesco, 1978

-. "Population Education vis-a-vis Family Planning", *Reprint Series*, No D-18, Bangkok, Unesco, 1979.

-. "Nature, Concept and Issues in Population Education," Bangkok, Unesco, 1980

-. "Population Education - Development and Prospect", Paper presented in a National Seminar of Local Education Administrators in Thailand, 2-3 December, 1985.

Family Planning Association of India, *Seminar on Population Education: Report of the Proceedings*, Bombay, FPAI, March ' 8, 1969

Fraser, Stewart F., *China: Population Education and People*, Canberra, Canberra Publishing, 1987.

Hutabarat, Sans S., *National Case Studies on the Development of Out-of-School Population Education Programmes*, Jakarta, National Population Education Project, Department of Education and Culture, 1978

Hutabarat, Sans S., et al., *Population Education in Indonesia*, Jakarta, National Family Planning Coordinating Board, 1979

International Labour Office, *In plant Population Education - An Asian Handbook*, Bangkok, International Labour Organization, 1977

Journal of the American Psychological Association, 1990, 115(1), 1-10.

Journal of the American Psychological Association, 1990, 115(1), 1-10.

Journal of the American Psychological Association, 1990, 115(1), 1-10.

Journal of the American Psychological Association, 1990, 115(1), 1-10.

Journal of the American Psychological Association, 1990, 115(1), 1-10.

Journal of the American Psychological Association, 1990, 115(1), 1-10.

Journal of the American Psychological Association, 1990, 115(1), 1-10.

Journal of the American Psychological Association, 1990, 115(1), 1-10.

Journal of the American Psychological Association, 1990, 115(1), 1-10.

Journal of the American Psychological Association, 1990, 115(1), 1-10.

Journal of the American Psychological Association, 1990, 115(1), 1-10.

Journal of the American Psychological Association, 1990, 115(1), 1-10.

Journal of the American Psychological Association, 1990, 115(1), 1-10.

Journal of the American Psychological Association, 1990, 115(1), 1-10.

Journal of the American Psychological Association, 1990, 115(1), 1-10.

- , *Population Education : Innovative Structures and Approaches*, Report of a Regional Workshop, New Delhi, 23-29 October, 1979, Bangkok, Unesco, 1980.
 - , *Population Education : A Source Book on Content and Methodology*, Bangkok, Unesco, 1980.
 - , *Population Education in Non-Formal Education and Development Programmes : A manual for field workers, Trial Edition*, Bangkok, Unesco, 1981.
 - , *Learning Experience in Population Education*, Bangkok, Unesco, 1985.
- United Nations Fund for Population Activities, *Population Education*, Population Profiles No. 11, New York, 1978.
- Viederman, "Population Education : Towards a Broader Definition", *Social Action*, Vol. 25, No. 1, January-March, 1975.
- Wayland, S., *Population Education in Relation to Folk Demography and Formal Demography*, New York, Columbia Teachers College, 1974.

POPULATION DYNAMICS

Agarwala, S.N., *India's Population Problems*, New Delhi, Tata McGraw Hill, 1971.

-, *Population*, New Delhi, National Book Trust, 1977.

Banister J., *China's Changing Population*, *Economic and Political Weekly*, Vol. 23, No. 31, July 1988,

Bebarta, P.C., *Family Type and Fertility in India*, North Quincy, Christopher, 1977.

Basu, Alaka and Kaushik Basu, "The Greying of Populations : Concepts Measurements," *Demography India*, Vol. 16, No. 1, 1987.

Benzamin, B., *Demographic Analysis*, London, George Allen and Unwin Ltd., 1974.

Bhattacharjee, P.J. and G.N. Shastri, *Population in India . A Study of Inter - State Variations*, New Delhi Vikas Publishing House, 1976.

Bogue, J. Donald, *Demographic Techniques on Fertility Analysis*, Chicago, Community and Family Studies Centre, 1971

Bose Ashish, *From Population to People*, Vol. I & II, Delhi, B R Publishing Corporation, 1988.

Brown, G.F., A.K. Jain and J. Gill, *Analysis of Population Policies and Programmes in India*, New York, The Population Council, 1987.

Bulatao, Rodolfo A., and Ronald D. Lee, Eds., *Determinants of Fertility in Developing Countries*, Volumes 1&2, New York, Academic Press, 1983.

Caldwell, J.C., *Theory of Fertility Decline*, London, Academic Press, 1982

Chaudhuri, K.T., *Demographic Trends in Assam 1921 - 71*, Delhi, B.R. Publishing Corporation, 1982.

Chaudhary, M., "Population Dynamics in India," *Journal of Family Welfare*, Vol. 28, No. 1, 1981.

Chaudhury, Mahinder, "Population Policy Target of Net Reproduction Rate of Unity By 2000 : How Realistic", *Economic and Political Weekly*, Vol. XXI, No. 48, 1986.

- Chaudhury, R.H., *Social Aspects of Fertility (With Special Reference to Developing Countries)*, New Delhi, Vikas Publishing House Pvt. Ltd., 1982.
- Chandrasekhar, S., *Infant Mortality, Population Growth and Family Planning In India*, London, George Allen and Unwin Ltd., 1972.
- Coale, Ansley J., "The History of Human Population", in Scientific American, *The Human Population*, San Francisco, Freeman, 1974.
- Crook, N. and T. Dyson, *India's Demography: Essays on the Contemporary Population*, New Delhi, South Asian Publications, 1984.
- Cormack, Mc. Arthur, *The Population Explosion*, New York, Harper Colophon Books, Harper & Row Publishers, 1973.
- Croontz, Sydney H., *Population Theories and the Economic Interpretation*, London, Routledge and Kegan Paul Ltd., 1957.
- Davis, Kingsley, *The Population of India and Pakistan*, Princeton, New Jersey, Princeton University Press, 1951.
- Desai, P.B., *Size and Sex Composition of Population in India*, Bangalore, Asia Publishing House, 1969.
- Dubey, R. M., *Population Dynamics: India (With Reference to Uttar Pradesh)*, Allahabad, Chugh Publications, 1981.
- Dyson, Tim and Nigel Crook, Eds., *India's Demography : Essays on the Contemporary Population*, New Delhi, South Asian Publishers, 1984.
- Freedman, R., " The Sociology of Human Fertility: A trend Report and Bibliography", *Current Sociology*, Vol. 10-11, No. 2, 1961, pp. 35-119.
- Ghosh, D.N., *Population Theories and Demographic Analysis*, Meerut Meenaskhi Prakashan, 1978.
- Glass, D.V. and D.E.C. Eversley, Eds., *Population in History*, London, Edward Arnold, 1965.
- Government of India, *India's Population : Demographic Scenario*, New Delhi, Department of Family Welfare, Ministry of Health and Family Welfare, 1988.
- Greep, R.O., *Human Fertility and Population Problems*, Cambridge, Schenkmar Publishing Company, INC, 1963.

Hance, A. William, *Population Migration and Urbanization in Africa*, New York, Columbia University Press, 1970.

Hardin, G., *Population Evolution Birth Control*, Santransisco, W.H. Freeman and Company, 1964.

Harper, A. Paul & Muramatsu, M., *Population Dynamics*, Maryland, Johns Hopkins Press, 1965.

Harrison, Paul and John Rowley, *Human Numbers, Human Needs : A People Handbook*, London, IPPF, 1984.

Heer, D., "Economic Development and Fertility", *Demography*, Vol. 3, No. 2, 1966, pp. 423-444.

International Union for the Scientific Study of Population, *Internation at Population Conference*, New Delhi, 1989, Volumes 1, 2, and 3, New Delhi IUSSP, 1989.

Jackson, J.A., *Migration*, London, Cambridge University Press, 1969.

Jones, G., "Population Trends and Policies in Vietnam", *Population and Development Review*, Vol. 8, No. 4, December, 1982.

Kamble, N.D., *Labour Migration in Indian States*, New Delhi, Ashish Publishing House, 1983.

Karkal, M., J. Kumar and I.K. Roy, *Sex Ratio : Demographic Analysis*, Bombay, International Institute for Population Studies, 1976.

King, Timothy and Alten C. Kelley, *The New Population Debate : Two Views on Population Growth and Economic Development* (Population Trends and Public Policy Paper No. 7), Washington, D.C. Population Reference Bureau, 1985.

Kohli, K.C., *Mortality in India - A Statewise Study*, New Delhi, Sterling Publishers (P) Ltd., 1977.

Lipton, M., *Demography and Poverty*, Washington D.C., World Bank, 1983.

Leon, L., "Teaching Demography", *Populi*, 12 (4), pp. 15-21, 1985.

Mc Keown, Thomas, *The Modern Rise of Population*, New York, Academic Press, 1976.

- Mahadevan, K. and P.J. Reddy, *Fertility and Mortality, Theory, Methodology and Empirical Issues*, New Delhi, Sage Publications India Pvt. Ltd., 1986.
- Martin, L.G., "The Aging of Asia", *Journal of Gerontology : Social Sciences*, Vol. 43, No. 4, 1988.
- Martin, L.G., "The Greying of Japan" *Population Bulletin*, 44, Washington D.C., Population Reference Bureau, 1989.
- Mitra, Asok, *India's Population : Aspects of Quality and Control*, Vols I and II, New Delhi, Abhinav Publications, 1978.
- , *Implications of Declining Sex Ratio in India's Population*, Bangalore, Allied Publishers, Pvt. Ltd. 1979.
- Nag, M and N. Kak, 'Demographic Transition in a Punjab Village', *Population and Development Review*, Vol. 10, No. 4, 1984.
- Pathak, K.K, P.S. Bhatia and M.K Premi, Eds., *Population Transition in South Asia*, New Delhi, Indian Association for the Study of Population, 1989.
- Pressant, R., *A Work Book in Demography*, London, Methuen & Co. Ltd., 1974.
- Raina, B.I. *Population Policy*, Delhi, B.R. Publishing Corporation, 1988.
- Salas, Rafael M., *Reflections on Population*, New York, UNFPA, Pergamon Press, 1984.
- Shrivastava, D.S., *Demography*, New Delhi, Vikas Publishing House Pvt. Ltd., 1983.
- Simon, Julian L., *The Ultimate Resource*, Princeton, N.J., Princeton University Press, 1981.
- Sinha, V.C., *Dynamics of India's Population Growth*, New Delhi, National Publishing House, 1979.
- Sinha, V.C and E. Zacharia, *Elements of Demography*, New Delhi, Allied Publishers (P) Ltd., 1984.
- Srinivasan, K. and S. Mukherjee, Eds., *Dynamics of Population and Family Welfare*, 1985, Bombay Himalaya Publishing House, 1986.
- Srinivasan, K., P.C Saxena and T. Kanitkar, *Demographic and Socio-economic Aspects of the Child in India*, Bombay, Himalayan Publishing House, 1979.

Tan, Jee and Michael R Haines, *Schooling and Demand for Children : Historical Perspective*, Washington D.C., World Bank, 1984.

United Nations, *Patterns of Urban and Rural Population Growth*, (Population Studies No. 68), New York, United Nations, 1980.

-, *Population in India, Country Monograph Series*, No. 10, New York, United Nations, 1982.

-, *Demographic Estimation : A Manual Of Indirect Techniques*, Manual, X, New York, United Nations, 1983.

-, *Report of the International Conference on Population, 1984*, New York, United Nations, 1984.

-, *1986 Demographic Year Book*, New York, United Nations, 1988.

-, *World Demographic Estimates and Projections 1950-2025*, New York, United Nations, 1988.

-, *World Population Trends and Policies : 1987 Monitoring Report*, New York, United Nations, 1988.

-, *World Population Prospects 1988*, New York, International Department of Economic Affairs, 1989.

Vlassoff, C and M Vlassoff, 'Family Type and Fertility in Rural India', *Journal of Biosocial Science*, 15, 1985.

Weaver, C.I., 'Social Security in Ageing Societies', *Population and Development Review*, 12 (Supplement), 1986.

Weeks, John R., *Population : An Introduction to Concepts and Issues*, California, Wordsworth Publishing Company, 1981

Widen, Lars, *Methodology of Population Projections*, Report Number, 9, Sweden Demographic Institute, University of Gothenburg, 1969

Wiley J., *Techniques of Population Analysis*, New York, John Wiley & Sons Inc., 1958.

World Bank, *The Effects of Family Planning Programme on Fertility in the Developing World*, Washington D.C., 1985, 206 P

POPULATION AND DEVELOPMENT

- Adams S. *Winds in a Cage: Institutional Change and Women's Position in Bangladesh*. Paper presented at the Conference on Women's Position and Demographic Change in the Course of Development Oslo, Norway, 15-18 June, 1988.
- Aparwar S N. *Age at Marriage in India*. Allahabad, Kitab Mahal, 1962.
- Atchar M and S. Ayesha. *Status of Rural Women in India*. New Delhi: Uppa Publishing House, 1982.
- Ali Mohammad, Ed. *Dynamics of Agricultural Development in India*. Delhi: Concept Publishing Company, 1979.
- Anker R. *et al.* *Indy: Womens Role and Population Trends in the Third World*. London: International Labour Organization, 1982.
- Anker R. and Hein C. 'Fertility and Employment in the Third World'. *Popul.* Vol. 1, No. 2, New York, 1985.
- Barnow Robin, Ed. *Case Studies in the Demographic Impact of Social Development Projects*. Ann Arbor: Michigan University of Michigan, 1983.
- Basu A M. *Culture, the Status of Women and Demographic Behaviour: A Field Investigation of Some of the Reasons*. New Delhi: NCAR, 1988.
- Bose Achal. *India's Urbanization 1901-2001*. SECOND REVISED EDITION. New Delhi: Tata McGraw-Hill, 1980.
- Brady W. *South South: A Programme for National Report*. *South South Centre*. Commission on International Development, United Countries, New York, 1988.
- Brown Alan A. and Egon Neuberger. *Internal Migration: A Comparative Perspective*. New York: Academic Press, 1979.
- Brown Lester R. *World Population Trends: Signs of Hope, Signs of Stress*. Washington D.C.: World Bank, 1988.
- Brown J. and J. F. Bruce. *The Demographic Transition and the Role of Women in Economic Development*. Washington Paper. Washington D.C.: World Bank, 1988.

Caro, M. *Women's Status and Politics in Developing Countries: Sex Preference and Fertility Norms* (World Bank Staff Working Paper No. 68). Washington D.C., The World Bank, 1984.

Chen, S.M. *Family Planning in Developing Countries: A New Technological and Demographic Analysis*. Bombay: Himalaya Publishing House, 1984.

Cheng, C.C. "The One-Child Family in China: The Need for Psycho-Social Research." *Studies in Family Planning*, IV, 1978.

Comm. Annex I. "Population Trends, Population Policy and Population Studies in China." *Population and Development Review*, Vol. 7, No. 1, March, 1981, pp. 85-97.

Cookson, S.H. *Family and Education: What Do We Know?* England: John Hopkins University Press for World Bank, 1979.

Concepcion, Mercedes. "Asia: Demography and Population." *Popul.*, Vol. 8, No. 40, 1981, pp. 18-40.

Cotter, L.B. "Status of Women: A Comparative Analysis of Twenty Developing Countries." *Papers of the World Population Society*, No. 5, Washington: Population Reference Bureau, 1982.

Devendra, K. *Status and Position of Women in India*. New Delhi: Veda Publications, 1985.

DSouza, Anthony D. *Population Growth and Human Development*. New Delhi: Indian Social Institute, 1974.

DSouza, V.S. *Women in Developing Areas: A Study in India*. New Delhi: Sage, 1985.

Dube, S.C. *India's Changing Faces: Family, Relationships and Women*. Patna: 1984.

Estess, Richard A. Ed. *Population and Economic Change in Developing Countries*. Chicago: University of Chicago Press, 1980.

ESCAP. *Report of Women and Community in Human Rights*. ESCAP, 1980.

Fox, H.D. Ed. *Study of Family Planning: Research on Social Change and Development*. Kharagpur: Orissa University Press, 1980.

- Ganguli, B.N., *Population and Development*, New Delhi, S. Chand and Company, 1973.
- Goyal, R.P., *Marriage Age in India*, Delhi, B. R. Publishing Corporation, 1988.
- Green M., *Urban Overcrowding Threatens Stability in LDC's Intercom*, Vol. 9 No. 2, February, 1981.
- Hance, A. William, *Population Migration and Urbanization in Africa*, New York, Columbia University Press, 1970.
- Hoover, M.E. and Coole J.A., *Population Growth and Economic Development in Low Income Countries. A case study of India's prospects*, New Jersey, Pricinton University Press, 1958.
- Houser, Philip M., Ed., *World Population and Development : Challenges and Prospects*, New York, Syracuse University Press, 1979.
- Jain, P.C., *Indian Population and Development*, New Delhi, NCERT, 1977.
- Kabir, M., *et al.*, "Participation of Women in Cooperative Programme : Economic Activity, Social Change and Family Planning, *Journal of Social Action*, Vol. 37, (Delhi), 1987.
- Kadi, A.S., "Age at Marriage in India", *Asia-Pacific Population Journal*, Vol. 2, No. 1, 1987.
- Kamble, N.D. *Labour Migration in Indian States*, New Delhi, Ashish Publishing House, 8/81, Punjabi Bagh, 1983.
- Khan, N., *Studies in Human Migration*, New Delhi, Rajesh Publication 1983.
- Kohli, Atul, *The State and Poverty in India*, Cambridge, Cambridge University Press, 1987.
- Kupinsky, S., Ed., *The Fertility of Working Women : A Synthesis of International Research*, New York, Praeger, 1977.
- Mahadevan, K., *Sociology of Fertility*, New Delhi, Sterling, 1979.
- Mason, K. *The Status of Women, Fertility and Hostality : A Review of Interrelationships*, New York, Population Studies Division, The Rockefeller Foundation, 1983.

- Mehta, R., *Socio-legal Status of Women in India*, New Delhi, Mittal Publication, 1987.
- Mesarovic, Mihajlo and Edward Pestel, *Mankind at the Turning Point : The Second Report to the Club of Rome*, New York, E.P. Dutton, 1974.
- Miller, B.D. *The Endangered Sex : Neglect of Female Children in Rural North India*, Ithaca, Cornell University Press, 1981.
- Murthy, M. Siva., *Growth and Structure of Human Population in the presence of Migration*, London, Academic Press, 1982.
- Nair, K.S., *Ethnicity and Urbanization : A Case Study of the Ethnic Identity of South Indian Migrants in Poona*, Delhi, M.R. Prints, 1978.
- Neils, Elaine M., *Reservation to City, Indian Migration and Federal Reallocation*, Chicago, University of Chicago, Printing Department, 1971.
- Oberai, A., *Migration, Urbanization and Development*, Geneva, International Labour Organization, 1987.
- Oberai, A.S. and H.K., Manmohan, Singh, *Causes and Consequences of Internal Migration, (A study in the Indian Punjab)*, Bombay, Oxford University Press, 1983.
- Panikar, P.G.K., and C.R. Soman, *Health Status in Kerala : Paradox of Economic Backwardness and Health Development*, Trivandrum, Centre for Development Studies, 1984.
- Patankar, P.G., *Urban Mobility in Developing Countries*, Bombay, Popular Prakashan, 1978.
- Paulus, C.R., *The Impact of Urbanization on Fertility in India*, Mysore, Prasaraanga, University of Mysore, 1978.
- Preston, Samuel, "Urban Growth in Developing Countries : A Demographic Reappraisal", *Population and Development Review*, Vol. 5, No. 2, June 1979, pp. 195-215.
- Pryor, Robin, J., *Migration and Development in South East Asia - A demographic perspectives*, Bombay, Oxford University Press, 1979.
- Puri, P.K., "Trends of Urbanization in India", *Proceedings of the Workshop on Migration and Urbanization*, New Delhi, Office of the Registrar General of India, 1987.

- Rao, G. Lakshmana Rao., *Internal Migration and Political Change in India*, New Delhi, National Publishing House, 1977.
- Rao, M.S.A., *Some Aspects of Sociology of Migration*, Sociological Bulletin, Vol. 3, No. 1, March, 1981.
- Ratcliffe, John, "Social Justice and the Demographic Transition : Lessons from India's Kerala State," *International Journal of Health Services*, 8, 1978.
- Riis, Jacob A., *How the Other Half Lives*, Cambridge, Harvard University Press, 1970.
- Robert, C., "Development and Population" *Economic and Political Weekly*, Vol. 11 Nos. 31-33, August, 1976.
- Rogers, B., *The Domestication of Women*, London, Tavistock Press, 1983.
- Sadik, N., "Muslim Women Today", *Populi*, Vol. 12, No. 1, New York, 1985.
- . "Integration of Women in Population and Development Programmes", *Asia-Pacific Population Journal* (3), pp. 3-20, September, 1986.
- Salas, Rafael, M., 'Populations and urbanization', *Asia-Pacific Population Journal*, Vol. 1, No. 1, 1985.
- Schutjer, Wayne A. and C. Shannon Stokes, Eds., *Rural Development and Human Fertility*, London, Macruillan, 1984.
- Sharma, A.K., *Social Inequality and Demographic Processes*, Delhi, Mittal Publications, 1985.
- Shiwalkar, R.S., *Twin Problems of Rural Development*, Allahabad, Kitab Mahal, 1968.
- Singh, Dayal Ram, *Population Structure of Indian Cities, A case study of the cities of Bihar*, New Delhi, Inter-India Publications, 1985.
- Tabah, I. Ed., *Population Growth and Economic Development in Third World*, Dolhain (Belgium), IUSSP, 1975.
- Taylor, D., Ed., *Women : A World Report*, London, New Internationalist and Methuen, 1985.
- United Nations, DIFSA, *Women, Demography and Development*, Canberra, Australian National University, 1985.

United Nations, *Women's Employment and Fertility : A Comparative Analysis of World Fertility Survey Results for 38 Developing Countries*, New York, DIESA, United Nations, 1985.

-, *Fertility Preferences : Selected Findings from the World Fertility Survey Data*, New York, DIESA, United Nations, 1986.

-, *Fertility Behaviour in the Context of Development : Evidence from World Fertility Survey*, New York, United Nations, 1987.

-, *The Prospects of World Urbanization*, (Revised as of 1984-85), New York, DIESA, 1987.

UNESCO, *Women in the Economy : Employment*, Bangkok, Unesco, 1986.

-, *Socio-Cultural and Attitudinal Factors Affecting the Status of Women in South Asia*, Bangkok, Unesco, 1986.

Uprethi, H.C., *Social Organizations of Migrant Group*, Bombay, Himalaya Publishing House, 1978.

Venkataraman, L.B., "Small Towns for Development", *Social Science Digest*, Vol. 2, Nos. 1-2, 1984.

Vlassoff, Carol and Barkat-e-Khuda, Eds., *Impact of Modernization on Development and Demographic Behaviour*, O Hawa, International Development Research Centre, 1988.

White, Paul and R. Woods, *The Geographical Impact of Migration*, New York, Longman Publishing House, 1980.

World Bank, *World Development Report*, 1988, New York, Oxford University Press, 1988.

-, *World Development Report 1989*, Washington D.C., World Bank, 1989.

Wrong, Dennis, H., *Population and Society*, 4th Edition, New York, Random House, 1979.

Zachariah, K.C., *A Historical Study of Internal Migration in the Indian Sub-Continent*, Bombay, Asia Publishing House, 1962.

-, "Land Reforms and Fertility Decline in Kerala, *Demography India*, 12, 1983, pp. 173-84.

POPULATION AND ENVIRONMENT

Burns, W. B. *Planning for the Maintenance of Biological Diversity*. Geneva: World Commission on Environment and Development, 1985.

Haskin, Judith. "The Rehabilitation of Upland Watersheds." Geneva: World Commission on Environment and Development, 1985. pp. 1-142.

Haskin, Judith. "Drought, Development, and Desecration." *Ecotone and Technical Works*, 16 August 1986.

Haskin, Judith. "Political Ecology of Drought and Water Scarcity." *Ecotone and Technical Works*, 12 December 1986.

Peck, Peter, and Harold Beckford. *Land Degradation and Scarcity*. Methuen Press, 1981.

Rock, Lester R. *The Ecology of the Desert: Accommodating Human Needs and Needs of the Desert Ecosystem*. New York: W. W. Horton and Co. Inc., 1978.

Rock, Lester R., and Edith Jacobson. *The Ecology of Urbanization: Ecology of the Desert and Desert Conservation*. Washington, D.C.: Woodwatch Institute, May 1980.

Rock, S. "The Concept of Carrying Capacity in the Desert." *USEPA Conference on Ecology and Technology*, 11-12-77.

Shelton, E. N. *Land Use and Water Policy*. Geneva: World Commission on Environment and Development, 1985.

Shelton, E. N., and J. Davidson. *Water and Development in the Desert World: A Study for the United Nations Technical Programme*, 1988.

Shelton, E. N., and S. Blackman. Eds. *Desertification: Managing the Desert World*. Cambridge, Massachusetts: MIT Press, 1988.

Shelton, E. N. P. *Desertification: Environmental Needs and Human Policy*. Cambridge, New York: W. W. Norton, 1988.

Shelton, E. N. *The Desertification of the Desert: Land Rights and Sustainable Development*. Washington, D.C.: W. W. Norton, 1988.

Shelton, E. N. *Desertification: Environmental Needs and Human Policy*. San Francisco, W. W. Freeman, 1977.

- Condonett, E. and S. Howard. *The Earth Report: Measuring the Battle for Our Environment*. London: Mitchell Beazley Press, 1988.
- Harter, Garrett. "The Impact of Community." *Scientist*, Vol. 102, No. 1859 [December 13, 1968], pp. 1-40-48.
- Hoggan, Graham, ed. *Population: Supplying Capabilities of Land in Developing Regions*. FAO, 1988.
- Ivey, Jane H. *The Export of Human*. Boston: Roxbury & Kegan Paul, 1988.
- Kopel, R. I. and S. P. Ray. *Concepts of Ecology*. Bangalore: Vidya Publications, 1984.
- Kravatha, S. L. "The World Population and Resource Problem." *Scientist*, 1984. *World Population Year*. Varanasi: Banarus Hindu University, 1984.
- Marden, Parker G. and Dennis H. Sloger. *Population, Environment, and the Quality of Life*. New York: AMS Press, 1985.
- Mexatovic, Mirko and Edward Post. *Man and the Land: From the Second Report of the UN on the World*. New York: I. P. Denton, 1984.
- Murison, P. *Land, Food and People*. Rome: Food and Agriculture Organization, 1984.
- Neri, Carl D. and Hershorn Arden. *The Land's Struggle: Population Pressure in Asia*. Baltimore: Johns Hopkins University Press, 1984.
- Ogden, Nathan and Nancy O. Jones. *Demographic Change and Human Resource Development in Communist and Pacific Asia*. Oxford: Yale-Norwalk University Population Research Institute, No. 8, 1988.
- Post, J. D. *Land, Food, and People*. London: The Human World, Baltimore: The Johns Hopkins University Press, 1987.
- Rosen, J. K. *Population Resources and Development*. Chicago: Rand, Council, IUCN, 1988.
- Rothman, H. *Population and Resources*. London: The Macmillan Press Ltd, 1981.
- Sachs, John E. and Herman Kahn, Eds. *The Wealth of Nations: A Report on the Future*. 1980. New York: Basic Books, 1980.

United Nations, Department of International Economic and Social Affairs, *Interrelations : Resources, Environment, Population and Development*, Proceedings of a United Nations Symposium held at Stockholm from 6-10 August, 1979, New York, United Nations, 1980.

United Nations Environment Programme, *General Assessment of Progress in the Implementation of the Plan of Action of Combat Desertification*, New York, United Nations, 1984.

-, *The State of the Environment 1985*, Nairobi, UNEP, 1985.

UNESCO, *Living in the Environment : A Source Book for Environmental Education*, Paris, 1985.

-, *Educational Module on Conservation and Management of Natural Resources*, Paris, Environmental Education Series. 3, 1986.

-, *The Balance of Life Kind : An Introduction to the Notion of Human Environment*, Paris, Division of Science, Technical and Vocational Education, Unesco, 1986.

World Health Organization and United Nations Environment Programme, *Global Pollution and Health*, Geneva, WHO/ UNEP, 1987, pp. 3-22.

Worldwatch Institute, *State of the World 1988*, New York, Norton, 1988.

Weaver, Mary Anne, "India : Greening of a Bad Drought", *Christian Science Monitor*, 25 May, 1983.

POPULATION HEALTH AND NUTRITION

Barnham, H., "Interaction of Infant Mortality and Fertility and the Effectiveness of Health and Family Planning Programs", *Policy Planning and Research Working Papers*, Washington, World Bank, 1988.

Bose, A., D.B. Gupta, and M.K. Premi, *Social Statistics : Health and Education*, New Delhi, Vikas Publishing House Pvt. Ltd., 1982.

Caliendo, Mary Alice, *Nutrition and the World Food Crisis*, New York, Macmillan, 1979.

Central Bureau of Health Intelligence, *Health Statistics of India*, Delhi, CBHI, Government of India, 1982.

-, *Health Information of India*, Delhi, CBHI, Ministry of Health and Family Welfare, Government of India, 1987.

CICRED, *Seminar on Infant Mortality in Relation to the Level of Fertility*, Bangkok, 6-12, May, 1975.

Cochrane, S. and K. Zacharia, "Infant and Child Mortality as a Determinant of Fertility : The Policy Implication", in United Nations, *Fertility and Family*, New York, United Nations, 1984, pp. 253-65.

Eckholm, Erik and Frank Record, "The Two Faces of Malnutrition", *World Watch Paper No. 9*, Washington, D.C., World Watch Institute, 1976.

ESCAP, *Significance of the Relationship Between Nutrition and Human Reproduction*, Bangkok, ESCAP, 1981.

Gopal, C. et. al., *Diet Atlas of India*, Hyderabad, National Institute of Nutrition, 1971.

Government of India, *Towards Universal Immunisation 1990*, New Delhi, Ministry of Health and Family Welfare, 1985.

-, *Child in India - A Statistical Profile*, New Delhi, Ministry of Welfare, 1985.

Gunarane, V.T. Herat, *Voyage Towards Health*, New Delhi, Tata McGraw-Hill, 1980.

Gupta, S.C., 'Sex Preference and Protein Calorie Malnutrition,' *The Journal of Family Welfare*, Vol. 32, No. 3, 1986.

- Hobcraft, J.N., J.W. Mc Donald and S.O. Rustein, "Child-spacing Effects on Infant and Early Child Mortality, *Population Index*, Vol. 496, No. 4, 1983, pp. 585-618.
- Hobcraft, J.N., J.W., Mc Donald and S.O. Rustein, "Demographic Determinants of Infant and Childhood Mortality: A Comparative Analysis," *Population Studies*, Vol. 39, No. 3, 1985, pp. 363-85.
- Immerhwar, G.E. and M. Pollack, *Health and Population Problems in Sri Lanka*, Washington D.C., American Public Health Organization, 1983.
- Jain, Anirudh J. and P.M. Visaria, *Infant Mortality in India*, New Delhi, Sage Publications, 1988.
- Kakar, D.N., *Folk and Modern Medicine*, Delhi, New Asian Publishers, 1977.
- Karkal, M., *Health of Mother and Child Survival*", in K. Srinivasan and S. Mukherjee, Eds., *Dynamics of Population and Family Welfare*, 1985, Bombay, Himalayan Publishing House, 1986, pp. 358-374.
- Kielmann et al., Eds. *Child and Maternal Health Services in Rural India: The Narangwal Experiment*, Vol. 1, Baltimore, The Johns Hopkins University Press, 1983.
- Lechtig, A., et al., "Effects of Maternal Nutrition on Infant Mortality", in H.W. Mosley, Ed., *Nutrition and Human Reproduction*, New York, Plenum Press, 1978, pp. 147-74.
- Maine, D. and R. Mc Namara, *Birth Spacing and Child Survival*, New York, Centre for Population and Family Health, Columbia University, 1985.
- Morley, D., *Paediatric Priorities in the Developing World*, London, Butterworth, 1973.
- Mosley, W. Henry, Ed., *Nutrition and Human Reproduction*, New York, Plenum Press, 1978.
- Mosley, W.H. and L.C. Chen, Eds., *Child Survival: Strategies for Research, Population and Development Review (Supplement to Vol. 10)*, 1984.
- Omran, A.R. and C.C. Standy, Eds., *Family Formation Patterns and Health*, Geneva, World Health Organization, 1976.

Pebly, A. and S. Millman, "Births Spacing and Child Survival", *International Family Planning Perspectives*, 12, 1986.

Rajgopalan, S., *Tamilnadu Nutrition Project*, Madras, Kalakshetia Publications Press, 1974.

Srinivasan, K., P.C. Saxena and Tara Kanitkar, Eds., *The Child In India*, Bombay, Himalaya Publishing House, 1979.

Taylor, Carl E., *et al.*, "Interactions between Health and Population," *Studies in Family Planning*, Vol. 9, No. 4, April, 1976, pp. 94-100.

United Nations, *Socio-economic Differentials in Child Mortality in Developing Countries*, New York, DIESA, United Nations, 1985.

United Nations Children Fund, *The State of the World's Children*, 1989, Oxford, Oxford University Press, 1989.

World Health Organization, Regional Office for South-east Asia, *A Decade of Health Development in South-east Asia*, New Delhi, WHO, 1989.

World Health Organization, *Sixth Report on the World Health Situation : Part One, Global Analysis*, Geneva, WHO, 1980.

Watson, Walter, *et al.*, "Health, Population and Nutrition : Interrelations, Problems and Possible Solutions", in Philip M. Hauser Ed., *World Population and Development : Challenges and Prospects*, New York, Syracuse University Press, 1979, pp. 145-73.

POPULATION AND FAMILY LIFE

- Bongaarts, John and R.G. Petter, *Fertility, Biology and Behaviour : An Analysis of the Proximate Determinants*, New York, Academic Press, 1983.
- Bongaarts, J., "A Model of the Spread of HIV Infection and the Demographic Impact of AIDS", *Statistics in Medicine*, January, 1989.
- Chang, Yun-Shik, "Ideal Family Size", in *Population and Family Planning in the Republic of Korea*, Vol. 2, Seoul, Korean Institute of Family Planning, 1974, pp. 330-44.
- Clausen, John A. and Susanne R. Clausen, "The Effects of Family Size on Parents and Children", in James T. Fawcett, *Psychological Perspectives on Population*, New York, Basic Books, 1973, pp. 185-208.
- Daniels, Victor G., *AIDS : The Acquired Immune Deficiency Syndrome*, 2nd ed., Lancaster, MTP Press, 1987.
- , *AIDS Questions and Answers*, 2nd ed., Cambridge, Medical Books, 1987.
- Diczfalosy, E. and A. Diczfalosy, Eds., *Research on the Regulation of Human Fertility*, Copenhagen, Scriptor, 1983.
- Dyson, T. and M. Moore, "On Kinship Structure, Female Autonomy and Demographic Behaviour in India", *Population and Development Review*, Vol. 9, No. 1, 1983.
- Fawcett, James T., Ed., *The Satisfaction and Costs of Children : Theories Concepts, Methods*, Honolulu, East-West Population Institute, 1972.
- Fawcett, James T. and Fred S. Arnold, *The Value of Children : Theory and Method*, Honolulu, East - West Population Institute, 1973.
- Fawcett, James T., et al., *The Value of Children in Asia and the United States: Comparative Perspectives*, Honolulu, East-West Population Institute, 1974.
- Gray, R.H., "Birth Intervals, Postpartum Sexual Abstinence and Child Health," in H.J. Page and R.L. Lesthaeghe, Eds., *Child-spacing in Tropical Africa: Traditions and Changes*, London Academic Press, 1981, pp. 93-110.
- Hawthorn, G., *The Sociology of Fertility*, London Collien Macmillan Limited, 1962.

IPPF, *Growing up in a Changing World*, 2 volumes, London 1985.

Jain, A.K. and J. Bengaarts, "Breast-feeding, Patterns, Correlates and Fertility Effects", *Studies in Family Planning*, Volume 12, Number 3, 1981, pp. 79-99.

Jones, Derek Liewellyn, *Human Reproduction and Society*, London, Faber and Faber, 1974.

Kapadia, K.M., *Marriage and Family Life in India*, London Oxford University Press, 1982.

Khan, Ansar Ali, "Family Life Education - Concept, Goal and Scope", Paper presented in National Seminar on Family Life Education in Malaysia, 21-25, April 1986.

Kiernan, K.E. and I. Diamond, "The Age at which Child Bearing Starts - A Longitudinal Study", *Population Studies*, Vol. 34, No. 3, 1983.

Lagone, John, *AIDS : The Facts*, Boston, Little Brown and Company, 1988.

Laing, John, "Natural Family Planning", *Studies in Family Planning*, Vol. 15, No. 2, 1984.

Mahadevan, K., *Sociology of Fertility*, New Delhi, Sterting Publishers (P) Ltd., 1979.

Mann, J. and J. Chin, "AIDS : A Global Perspective", *The New England Journal of Medicine*, 319, 1988.

Mann, J., *et al.*, "International Epidemics of AIDS," *Scientific American*, October 1988.

Menleen, Jane L., "Age and Fertility : How Late Can You Wait?" *Demography*, 22, 1985.

National Academy of Science, *Confronting AIDS*, Washington D.C., 1986.

Perez, A.P. Vela, G. Masnick and R.G. Potter, "First Ovulation after Child birth : The Effect of Breastfeeding," *American Journal of Gynecology*, 114, 1972.

Prakash, M. and S. Mathew, *Teacher's Manual in Family Life Education*, Bombay, Population Education Cell, Dept. of Adult and Continuing Education, 1985.

Siddh, K.K., *Family Planning-the Religious Factor*, New Delhi, Abhinav Publications, 1974.

Snowden, R., *The IUD - A Woman's Guide*, London, Unwin Paperbacks, 1986.

Talwar, G. P., Ed., *Contraception Research for Today and the Nineties*, New York, Springer-Verlag, 1988.

United Nations, *Family Building by Fate or Design*, New York, DIESA, United Nations, 1987.

-, *Adolescent Reproductive Behaviour : An Annotated Bibliography*, New York, DIESA, United Nations, 1988.

United Nations, *Levels and Trends of Contraceptive Use as Assessed in 1987*, New York, United Nations, 1989.

UNESCO, *Family Life Education*, Package One, Bangkok, Unesco, PROAP, 1986.

-, *Sex Education*, Package Two, Bangkok, Unesco, PROAP, 1989.

-, *Education for Prevention and Control of AIDS*, Abstract-Bibliography Series 10, Bangkok, Unesco PROAP, 1989.

World Health Organization, *Guide to Planning Health Promotion for AIDS Prevention and Control*, (WHO AIDS Series 5), Geneva, WHO, 1989.

POPULATION AND EDUCATIONAL DEVELOPMENT

- Allman, J., *The Impact of Education on Fertility Patterns*, Paris, Unesco, July 1973.
- Brembeck, C.S., Ed., *New Strategies for Educational Development*, East Lansing, Michigan State University Press, 1973.
- Calado, R.R. and ESCAP Secretariat, "Population Growth and Educational Development", in *Population of the Philippines*, Bangkok, ESCAP, 1978.
- Coldwell, John C., "Mass Education as Determinant of the Timing of Fertility Decline", *Population and Development Review*, Vol. 12, No. 2, 1980.
- Chau, Ia Ngoc, *Population Growth and the Cost of Education in Developing Countries*, Paris, Unesco 1972.
- , *Demographic Aspects of Educational Planning*, Paris, Unesco, 1969.
- , *Population Growth and Costs of Education in Developing Countries*, Paris, Unesco, 1978.
- Cochrane, Susan Hill, *Fertility and Education: What Do We Really Know?* Baltimore, Johns Hopkins University Press for World Bank, 1979.
- Coombs, P.H. *The Fundamentals of Educational Planning in the Next Decade*, Paris, Unesco, 1967.
- Gore, M.S., *Education and Modernization in India*, Delhi: Rawat Publishing, 1982.
- Jayasuriya, J.E., "Population Change and Educational Development", *International Social Science Journal*, Paris, Unesco, Vol. XXVI, No. 2, 1974.
- Jones, Gavin W. and Ashraf K. Kayam, *Population Growth and Educational Progress in Ceylon*, Colombo, Caxton, 1971.
- Jones, Gavin W., "Effects of Population Change in the Attainment of Educational Goals in Developing Countries", in U.S. National Academy of Sciences, *Rapid Population Growth: Consequences and Policy Implications*, Baltimore, Johns Hopkins University Press, 1971.
- , *Population Growth and Planning in Less Developed Countries*, New York: Appleton-Country-Crafts, 1973.

- , *Population Growth and Educational Planning in Developing Nations*, New York, Halsted Press, 1975.
- Macleod, Betty, *Demography and Educational Planning*, Ontario, Ontario Institute for Studies in Education, 1970.
- Ministry of Education, *Challenge of Education - A Policy Perspective*, New Delhi, MOE, Government of India, August, 1985.
- Ministry of Human Resource Development, Government of India, *National Policy on Education - 1986*, New Delhi, MHRD, Government of India, (Department of Education), May 1986.
- , *National Policy on Education 1986: Programme of Action*, New Delhi, MHRD, Government of India, Department of Education, November, 1986.
- Nam Charles B., *Population and Society*, Boston, Houghton Mifflin, 1968.
- Singh Butalia, Marianne, *Education and Population Dynamics*, Paris, Unesco 1971.
- Stockard, et. al., Eds., *Sex Equity in Education*, New York, Academic Press, 1980.
- Sutherland, Margret B., *Sex Bias in Education*, Oxford, Basil Blackwell, 1981.
- , *Growth and Change : Perspective of Education in Asia*, Paris, Unesco, 1972.
- , *Population Dynamics and Educational Development*, Bangkok, Unesco ROEA, 1974.
- Unesco Regional Office for Education in India, *Population Dynamics and Educational Development*, Bangkok, Unesco, 1974.

CONTRIBUTORS

- Dr. R.C. Sharma
Regional Adviser for In-School Population Education, UNESCO Principal Regional Office for Asia and the Pacific (PROAP), Bangkok
- Professor B.S. Parakh
Former Dean, Academic, National Council of Educational Research and Training, NCERT, New Delhi
- Dr. J.L. Pandey
Reader, National Population Education Project, Department of Education in Social Sciences and Humanities, NCERT, New Delhi.
- Dr. Mahendra K. Premi
Professor, Centre for Study of Regional Development, Jawaharlal Nehru University, New Delhi
- Dr. Prem C. Sexana
Professor, Department of Mathematics Demography and Statistics, International Institute for Population Sciences, Bombay
- Dr. L. Ramachandran
Former Director, Gandhigram Institute of Rural Health and Family Welfare, Tamilnadu.
- Dr. K. Saradamoni
Senior Fellow, ICSSR, Institute of Management in Government, Trivandrum
- Dr. C.K. Varshney
Professor, School of Environmental Sciences, Jawaharlal Nehru University, New Delhi
- Dr. S.D. Gupta
Professor, Indian Institute of Health Management Research, Jaipur

Dr. Akilesh Vargava

Assistant Professor, Department of Preventive and Social Medicine S.M. Medical College, Jodhpur

Dr. S.G. Srikantia

Hon. Professor of Food and Nutrition, Post-Graduate Department of Teaching and Research in Home Science, University of Mysore, Mysore

Dr. Mahinder C. Watsa

Consultant, Sex Education and Counselling Programme, Family Planning Association of India and Head, Sex Education Counselling Research Therapy Centres, F.P.A.I. Bajaj Bhavan, Bombay

Dr. R.N. Gupta

Asstt. Director-General, Indian Council of Medical Research, New Delhi

Dr. A.S. Seetharamu

Professor and Head, Education Unit, Institute for Social and Economic Change, Bangalore.

Index

A

- Abridged life table, 86
- Abstinence, 265
- Acidification, 152, 153, 164
- Acid rain, 163-164
- Acquired Immune Deficiency Syndrome (AIDS), 34, 200, 273; definition, 353; diagnosis of, 354-355; how transmitted, 355; prevention of, 355-356; symptoms of, 353-354
- Adolescence, definition, 240-242; emotional aspirations and conflict, 242-243; physiological changes, 241; and pre-adolescence, 240; problems of, xiii, 34, 245-254
- Adolescents, 34, 231, 233, 235, 236, 242; developmental problems, 245-246; developmental stages, 338-339; developmental tasks, 338; and drugs, 247; emotional changes, 251, 337; and parents, 244-245, 250-251; physical changes, 241, 251; psycho-social problems, 246-247; and sexual drive, 243-245; sexually transmitted diseases, 247; smoking, 247
- Adolescent counselling, 247-254; good counselling, 249; handling problems of adolescents, 249-250; need for, 247-248; questions teenagers ask, 250-254
- Adolescent education, xiii, 34
- Adolescent sexuality, development problems of, 245-246; psycho-social problems of, 246-247
- Adult education, xi, 9, 35, 290-291
- Afghanistan, 15
- Africa, 43, 44
- Age at marriage, 81, 305
- Age at menarche, 214, 327
- Age composition, 67-71
- Age dependency ratio, 297
- Age-specific death rate, 84
- Age-specific fertility rate, 77, 297; India and major states, 309; rural-urban, 308; trends, 308
- Age-specific mortality rate, 84
- Aging, 34
- Agricultural land, 152, 166, 168
- Air pollution, 152, 153, 154, 159, 160 162-163, 165
- Air Prevention and Control of Pollution Act, 167
- Alkalization, 152
- All India Education Surveys, 288; fifth, 283, 287
- Alma Ata Conference, 124
- Alpha and beta particles, 177
- Ambannavar, J.P., 293
- Aminocentesis, 132
- Anaemia, 222-223, 329
- Anaemia Prophylaxis Programme, 226-227
- Andaman & Nicobar Islands, 53, 55, 58, 62, 134, 285
- Andhra Pradesh, 52, 54, 56, 59, 61, 79, 133, 200, 285, 286, 290
- Antarctica, 166
- Applied Nutrition Projects, 281
- Approach Paper of the Eighth Five Year Plan, ix
- Appropriate technology, 124, 125
- Aquifer, 156, 159
- Arabian sea, 162

Aristotle, 106
 Arms Control and Disarmament Agency (ACDA), 4, 5
 Arunachal Pradesh, 51, 53, 55, 58, 62, 134, 223, 285, 290
 Asia, 43, 44
 Asian Forum of Parliamentarians for Population and Development, 7
 Assam, 51, 53, 55, 58, 61, 133, 155, 285
 Attitude, viii, 7, 9, 11, 15, 16, 17, 19, 21, 28, 31, 34, 37, 239, 277
 Audio-visual materials, 37
 Australia, 44

B

Balwadis, and Anganwadis, 281
 Bangladesh, 43
 Basal body temperature, 267
 Basic Needs framework, 277
 Basic measures of fertility, 76-82; of mortality, 83-86
 Bay of Bengal, 162
 Belgium, 99
 Behaviour, 15, 16, 17, 19, 34, 231, 232, 234, 239
 Beliefs and values, 28, 34
 Bharat Aluminium Company, 160
 Bhattacharya, D., 46, 47
 Bhatt, Chandi Prasad, 169
 BHC, 158, 159
 Bhopal gas, 167
 Bihar, 51, 53, 55, 57, 58, 61, 111, 133, 149, 155, 180, 181, 195, 223, 284, 285, 286, 290
 Biogas, 173, 180-181
 Biological Oxygen Demand (BOD), 161

Biology, viii, 31
 Biomass, 179, 180
 Biosphere reserves, 170-171
 Birth Control League, 107
 Birth Order, 71, 76
 Birth rate, 25, 26, 27, 32; in India and major states by rural-urban, 306; trends in major states, 307
 Birth weight, 187, 328; low, 197
 Blindness, 201-202
 Bose, Ashish, 65
 Botanical Survey of India, 154
 Bovine population, 157
 Brandt Report, 4
 Breast-feeding, 266
 British Antractic Survey, 325
 Mrs. Bruntland, 152
 Bucharest World Population Conference, 2, 115

C

California, 169
 Cancer, 201, 202
 Carbon dioxide, 163, 164, 165, 176
 Carbon monoxide, 176
 Cardiovascular disease, 201
 Caribbean, 44
 Carson, Rachael, 159
 The Cauvery, 161
 Census in India, 47-49; changes in the system, 49-50; post enumeration checks, 149; quality of census enumeration, 48-49
 Central America, 44
 Central Health Education Bureau, 34

- Central Pollution Control Board, 158, 167, 173
- Cervical mucus, 267-268
- Chandigarh, 51, 53, 55, 58, 62, 63, 134, 285
- Chandrasekharan, C., 293
- Chemicals, 153, 157, 158, 161, 167; and pesticides, 157-159
- Chernobyl accident, 178
- Child bearing period, 71
- Child development, 28
- Childhood malnutrition, 229
- Child Marriage Restraint Act, 149
- Child mortality, 88-93, 320-321; causes of, 91-93; health programmes, 93
- Child mortality index, 216
- Child mortality rate, 217
- Child survival programmes, 229
- Child-woman ratio, 78
- Chipko movement, 169
- Chlorofluorocarbons, 165, 166, 324, 325, 326
- Cholera, 200
- Cinchona, 170
- Clearing House, 37
- Coal, 159, 174-175
- Coale, Ansley, J., 278
- Co-curricular activities, x, 35, 37
- Cohort life table, 85
- Colleges of Teacher Education, 36
- Columbia, 5
- Columbia University, 7
- Committee on Environmental Planning and Coordination, 167
- Common deficiency diseases, xiii
- Communicable diseases, 198-200
- Community Development Programme, 189
- Complete life table, 86
- Composting, 172
- Condom, 269
- Conservation, 153
- Constitution of India, 130, 131, 189, 279, 292
- Constitution (Fortysecond Amendment) Act, 166
- Constitutional obligations, 28
- Consumer education, 33
- Consumption explosion, 3
- Consumption style, 3-4
- Content and process of education, x, xi
- Contraceptive prevalence rate, 279
- Conventional sources of energy, 179
- Copenhagen World Conference, 129-130
- Core curricular areas, 28
- Counselling basis for, 250; definition, 247-249; need for, 247-248
- Crude birth rate, definition, 77, 297; in India, 78-79; in states, 79; rural-urban differentials, 79-80
- Crude death rate, definition, 84, 297; in India, 86
- Current life table, 85
- ## D
- Dadra and Nagar Haveli, 52, 54, 56, 59, 62, 134, 285, 290
- Damodar Valley, 182
- Das Gupta, Ajit, 46, 47
- David, Wayne, H., 3
- Davis, Kingsley, 46, 47
- DDT, 158-159

Death rate, 25, 26, 27, 32, 82; in India and major states by rural-urban 312; in India by sex, 314; by sex in major states, 314; trends in, 313

Deficiency diseases, 328; stages in development of, 220

Deforestation, 152, 153-154, 155, 168-169, 170

Delayed marriage, 34

Delhi, 51, 53, 55, 57, 58, 62, 63, 134, 159, 171, 292

Demography, viii, 34

Demographic concepts, Abridged life table, 86; age-specific death rates, 84; age-specific fertility rates, 77; age-specific mortality rates, 84; birth order, 71, 76; child-woman ratio, 78; cohort life table, 85; complete life table, 86; contraceptive prevalence rate, 297; crude birth rate, 77, 297; crude death rate, 84, 297; current life table, 85; death, 83; dependency ratio, 297; eligible couples, 297; emigration, 94; expectation of life at birth, 84-85, 298; family size, 71; fecundity, 71; fertility, 71; foetal death, 83; foreign-born population, 297; general fertility rate, 77, 297; gross fertility rate, 77-78, 297; gross reproduction rate, 77-78, 297, 311; growth rate, 297-298; immigration, 94; infant mortality rate, 85, 298; infecundity, 71; in-migrants, 94; life table, 85; live birth, 71; mean age at first marriage, 298; medium age, 298; migrants, 94; migration, 93; migration rates, 96-97; migration stream, 95; miscarriage, 83; mortality 83; natality, 71; natural rate of increase, 298; net migration rate, 298; net reproduction rate, 298, 678; out-migrant, 94; parity, 71, 76; population momentum, 298; rate of natural increase, 298-299; reproductive period, 71; sex-ratio, 299; sex-ratio at birth, 299; stationary population, 299; sterility, 71, 76; still birth, 83; survival ratio, 299; total fertility rate, 77, 299; total marital fertility rate, 299; urban population, 63-65, 299; zero population growth, 299

Demographic goals, viii, 27, 110, 111

Demographic indicators, 300-303

Demographic transition in India, first stage, 25, second stage, 26

Demographic trap, 26

Demographic trends in India, 304

Demographic Year Book, 83

Denudation, 154

Department of Non-Conventional Sources of Energy, 179, 180

Desertification, 152, 153, 154, 155, 160, 174

Development and environment, 151-173; and fertility control, 122, 123; and natural resources, 173-182; and population, 1-6, 26-27, 116-121, 123-127; and women, 129-149

Developed countries, 2, 3

Developing countries, 2, 5, 6, 13

Development education, 33

Diabetes, 201

Diabetic Association of India, 201

Diaphragm, 270

Diarrhoeal diseases, 200

Diarrhoeal Diseases Control Programme, 207

Diet Survey Data, 221

Diphtheria, 200

Directive Principles of State Policy, 166, 189, 279

Directorate of Adult Education, 35, 37

District Institutes of Education and Training (DIETs), 36

District Tuberculosis Centres, 206

Documentation Centre, 37

Dowry Prohibition Act, 148

Draft Syllabus on Population Education 32, 33

Drugs, 247

Durand John V., 44, 46, 47

Dust pollution, 163

Dutta, Jatindra Mohan, 64, 47

E

Early Childhood Care and Education, 28, 280-281

Eastern Africa, 44

Economic activity and women, 145-148

Economics, vi, 31, 32

Economic development, 32, 34, 115-126, 156, 176

Ecological crisis, 152

Ecology, viii

Economic status and food intake, 209-210

Edger, M. Hoover, 278, 279

Education, 25, 26, 121, 151; in A.D. 2000, 292-294; as a component of development, 1, 121, 125; and employment, 233-234; and fertility, 6, 80; population change, 277-294; and its potential as an intervention, 7, 27-29, 110-111; and quality of life, 277-278; of socially disadvantaged, 291-292; of women, 142-145

Educational intervention, 27

Education Commission, 297

Education policy in India, 27-29, 279-280

Effluents, 158, 161, 167, 176, 177

Electronic media, use of, 37

Eligible couples, 297

Emigration, 94

Employment, 25, 26, 45, 151; and education, 233-234

Energy, 27, 176-182

England, 99

Environment, x, 26, 27, 28, 29; and population, 151-182; status of, 151-152; and sustainable development, 152-153; and urbanization, 151

Environmental acidification, 163-164

Environmental degradation, 153, 154, 160, 166, 181; consequences of, 152; and poverty, 152

Environmental education, 33

Environmental hazards, 178-179

Environment Protection Act, 167

Environmental refugees, 160

Equal Remuneration Act, 148

Europe, 3, 44, 163

Evaluation, x, xii, xiii, 19, 21, 37; and research, 19; and longitudinal studies, 21

Expectation of life at birth, 84-85, 87, 298

Expert Committee on Population projection, 102, 103

F

Factories Act, 167

Family life, x, 28, 34, 234; basic components of, 28

Family life education, ix, xiii, 10, 14-15, 21, 231-254

Family planning ix, 7, 17, 31, 32, 107, 108, 109, 110, 123, 126, 141, 264-265

Family Planning Association of India, 9, 29, 34

Family Planning Cell, 107

Family planning education, 10, 33, 232

Family Planning Foundation, 122

Family Planning methods, 32, 122, 125, 141, 265-272, 327; abstinence 265; basal body temperature, 267; breast feeding 266; cervical mucus, 267-268; condom, 269-270; diaphragm, 270; intra-uterine devices, 271; modern, 269-272; natural, 266-269; oral pills, 271-272; rhythm, 267; spacing, 269-272; spermicides, 270; symptothermal, 268-269; traditional, 265-266; tubal sterilization, 272; vasectomy, 272; withdrawal, 265-266

Family Planning Programme, 6, 9, 25, 26, 106-111, 116, 125, 141

Family size, 32, 33, 34, 71, 217-219, 229, 327, 328; and calorie intake, 327; and family welfare, 34; and malnutrition, 328; and nutrient intake, 328; and nutritional status, 217-219

Family Welfare Programme, 26, 110, 141, 225

Fecundity, 71

Feeding practices, 211-212; during infancy, 211; during sickness, 211-212

Female body clock, 330-333; puberty, 330; sequence of changes, 330-333

Female reproductive physiology, 260-263

Fertilizers, 157-158, 161, 169, 172, 173

Fertility, 5, 6, 71-82, 116; age at marriage and, 81; basic measures of, 76-82; definition of 71; education and 80; income and, 80-81; occupation and, 81; social action system and, 82; sources of data, 76

Fertility behaviour, 6, 115

Fertility control, 122, 123

Fertility foods, 215-216

Fertility rate, 29, 308-311

Fertility regulation, xiii, 264-272

Finland, 5

Fifth Five Year Plan, 108, 109, 117, 190, 194, 277

Fiji, 10

First Five Year Plan, 107, 108, 116, 190, 194, 289

Flooding, 153, 155-156

Flora and fauna, 156-157, 177

Fodder, 152, 153, 155, 168, 169

Foetal death, 83

Food, 25, 26, 27, 45, 117-119, 152, 153

Food beliefs and food taboos, 210-211

Food grain production, 209

Food intake, effects of feeding practices, 211-212; effects of food beliefs and food taboos, 210-211; gender differences in, 224-225, 329

Foreign born population, 297

Forest, 151, 152, 153-154, 164, 166, 167, 168, 170, 173, 181

Fourth Five Year Plan, 108, 109, 116, 167, 190, 194

Fuel, 120-121, 154, 155, 169, 181

Fuelwood, 152, 168

G

Gandhi Indira, 7

Gandhi, Mahatma, 118, 119

The Ganga, 161, 165; cleaning up of, 172-173

Ganga Action Plan, 173

Gender difference in food intake, 224-225, 329

Gender fertility rate, 77, 297

Geography, viii, 31

Geological Survey of India, 174, 182

Geothermal energy, 179, 181-182

Global warming, 165

Goa, Daman & Diu, 52, 54, 56, 59, 62, 134, 285

Goals for health and family welfare programmes, 322-323

The Godavari, 161

Goitre Control Programme, 227

Gonorrhea, 273, 347-349

Government of India, 26, 107, 109, 110, 129, 130, 167, 168, 169, 173, 179, 279, 282

Government of Maharashtra, 9, 29, 30

Grazing land, 154, 155

Great Nicobar, 171

Green House Effect, 153, 164-165

Gross National Product (GNP), 3
 Gross reproduction rate (GRR), 77-78, 297, 311
 Ground water exploitation, 153, 156
 Growing up (see adolescence)
 Growth rate, 297-298
 Gujarat, 52, 54, 56, 59, 60, 61, 79, 111, 133, 156, 285, 290, 292
 Gulf of Cambay, 182
 Gulf of Kutch, 182

H

Hardin, Garrett, 3
 Haryana, 51, 53, 55, 58, 60, 61, 111, 133, 170, 223, 285, 292
 Hauser, Philip M., 7
 Health, 25, 26, 27, 28, 45; and deficiency diseases, 219-224; definition of, 185-186; determinants of, 186; in India, 189-190; indicators of, 186-188; and mortality and morbidity, 195-202; national policy, 203-205; national programmes, 206-208; and population explosion, 191-194; profile of India, 190-202
 Health care of women, 132-138
 Health education, 30
 Health for All, 203
 Health policies and programmes, xiii, 203-208
 Health services, 202-203, urban utilization rate of, 188
 Herodotus, 45
 Herpes Simplex, Type II, 273, 351-352
 High pregnancy wastage, 327
 Himachal Pradesh, 51, 53, 55, 57, 58, 61, 62, 133, 182, 223, 284, 285, 290, 293
 Home economics, 31
 Homosexuality, 240
 Housing, 25, 26, 27, 45, 119-120, 151

Human reproduction, xiii, 16, 257-274; and family planning methods, 265-272; and fertility regulation, 264-265; physiology of, 258-264; and sexually transmitted diseases, 272-274

Human resource development, 32, 34

Human Rights Day, 5

Human sexuality, definition of, 237-238; difference with other mammals, 237, stages of, 238-247

Huxley, Sir Julian, 8

Hydro-electric generation, environmental impact, 177

I

Immigration, 94
 Income and fertility, 80-81
 Inculcation of scientific temper, 28
 Indecent Representation of Women (Prohibition) Act, 148
 Indian Council of Medical Research, 126
 Indian equivalents, 4
 Indian Institute of Technology, 182
 Indonesia, 170
 Infants, causes of death, 91-93; causes of diseases among, 195-196
 Infant mortality, 88-93, 195-198; causes of, 88-89, 91-93; health programmes and, 93
 Infant mortality rate, 27, 85, 136, 217, 298; average estimate, 318; causes of high, 197; definition, 85, 298; by rural-urban, 88, 315; by sex, 88, 316; selected indicators of, 319, trends in, 317
 Infecundity, 71, 76
 Information networking, x, 37
 Infrastructural achievements, 190
 In-migrant, 94
 Insecticide Act, 159, 167

Ishwarbhai Patel Committee, 279

Integrated Child Development Programme Services, 28, 227, 281

International Conference on Population 1984, 152

International economic system, 2

International Planned Parenthood Federation, 152

International Union for Conservation of Nature and Natural Resources, 152

International Women's Year, 129

Intra-uterine devices (IUDs), 271

Iodine deficiency, 223, 329

Iodine deficiency diseases, 223-224

Issues of population education, conceptual, 17; curriculum development, 17-18; evaluation and research, 19; institutionalization, 20; methodology of teaching 18; operational, 19-20; training, 18-19

J

Jammu and Kashmir, 51, 53, 55, 58, 60, 61, 133, 223, 285, 290

Jana Siksha Nilayam, 291

Japan, 3, 13, 25, 43, 44

Jhum cultivation, 155

K

Kanitkar, Tara, 90

Kanwar, J.S., 155

Karnataka, 52, 54, 56, 57, 59, 60, 61, 79, 133, 223, 285, 291

Kerala, 52, 54, 56, 57, 60, 61, 62, 79, 132, 140, 145, 177, 195, 285, 290

Korea, 5, 6, 10, 11, 17, 26

Kothari, D.S., 279

The Krishna, 161

396

Kumarappa, J.M., 88

The Kunthipuzha, 177

L

Lactation amenorrhoea, 215

Ladakh, 181, 182

Languages, 30

Lakshadweep, 52, 54, 56, 57, 59, 62, 134, 163, 285

Land degradation, 152, 155

Land fills, 172

Latin America, 10, 43, 44

Leprosy, 199-200

Leprosy Eradication Programme, 207

Less developed countries, 5, 42-45

Life expectancy at birth, 84-85, 298

Life table, 85-86

Life support systems, 153

Literacy, 125, 290-291, 292, 293; rate, 121, 142, 290, 303; rate of women, 143; of women, 29, 142-145

Low birth-weight baby, 216, 327-328

Lower enrolment, 142-143

M

Madhya Pradesh, 50, 51, 53, 56, 59, 60, 61, 79, 133, 149, 195, 223, 285, 286, 290, 292

Mahalanobis, P.C., 47

Maharashtra, 52, 54, 56, 59, 60, 61, 79, 91, 133, 156, 223, 285, 290.

The Mahi, 161

Malaria, 159, 161, 189, 198

Malaysia, 5, 15

Malcolm Adiseshaiah Committee, 279

Male body clock, 334-336; puberty, 334;

- sequence of changes, 334-336
- Male reproductive physiology, 258-260
- Malnutrition, 190, 196, 209, 212, 214, 215, 217, 218, 219, 226, 228, 327, 328, 329; causes of childhood fertility, 219-220, 229, 328; gender difference, 224-225; and protein-energy, 220-222
- Mandakini Valley, 169
- Manikakaran, 182
- Manipur, 51, 53, 55, 58, 60, 61, 133, 223, 285
- Man-land ratio, 151
- Marine environment, 162
- Masculinity proportion, 66, 67
- Masterbation, 246, 253
- Maternal and child care, 28, 81, 82, 109, 135, 138-140, 197, 227, 281
- Maternal mortality, 88, 91, 136, 139, 187, 189, 197-198, 214, 223
- Maternal mortality rate, 91, 136, 139, 198, 214, 224
- Mathematics, 8, 30
- Maurya, Chandragupta, 45
- Mean age at first marriage, 298, 305
- Measles, 200
- Median age, 298
- Medical Termination of Pregnancy act, 109, 135, 247
- Medicinal Plants, 153
- Medicine, viii
- Meghalaya, 51, 53, 55, 58, 60, 61, 133, 223, 285
- Menarche, 71, 214, 241-242, 330, 331, 332, 338, 339
- Menopause, 71
- Menstruation, 245, 253-254, 263-264, 331, 332
- Mental health, 185
- Methane, 165
- Mexico City, 129, 152
- Mid-day meal programme, 226, 228, 284
- Middle Africa, 44
- Midgley, Thomas, 325
- Migrant, 94
- Migration, 93-98; rates, 96-97; sources of data for, 95-96; stream, 95; trends, 97-98
- Military expenditure, 4, 5
- Mineral resources, 174-176
- Minimum Needs programme, 277
- Minimum National Effluent Standards, 158
- Minining, 159-160, 174
- Ministry of agriculture, 154
- Ministry of Education and Social Welfare, 129
- Ministry of Education and Youth Services, 30
- Ministry of Environment and Forests, 167
- Ministry of Health and Family Planning, 30
- Ministry of Health and Family Welfare, 27
- Ministry of Human Resource Development, 143
- Ministry of Social Welfare, 281
- Ministry of Women and Child Welfare, 281
- Mizoram, 51, 53, 55, 58, 62, 134, 285
- Modern contraception, 27, 269-272
- Molina, Mario, 325
- Molluscum contagiosum, 357
- Montreal Convention, 325
- Moreland, W.H., 46, 47
- Morocco, 5
- Mortality, 71, 83-93; basic measures of, 83-86; definition, 83; levels of, 86-93; sources of statistics, 83
- M.S. University, 34
- Mudaliar, A.L., 279

Myrdal, Alva, 7

N

Nagaland, 51, 53, 55, 58, 60, 61, 133, 223, 285, 290

Nanda Devi, 171

The Narmada, 161

The Narmada-Sone Valley, 181

Nath, Pran, 46

National Agriculture Commission, 168

National Commission on floods, 155

National Commission on Self-employed Women, 147, 149

National Council of Educational research and Training, ix, 9, 32, 34, 37, 111, 145, 279

National Council of Teacher Education, 36

National Diet Survey, 224, 329

National education policy, ix, 27-29

National Filaria Control Programme, 206

National Forest Policy, 169

National Guinea Worm Eradication Programme, 207

National Health Policy, 203-205

National Health Programmes, 206-208

National income, 32

National Leprosy Control programme, 207

National Literacy Mission, 290, 293

National Malaria Eradication Programme, 206

National Nutrition Programmes, xiii, 225-228

National Perspective Plan for Women, 130, 135-136, 138, 147, 149

National Planning Committee, 107, 130

National policy for children, 281

National Policy on Education, ix 27-29, 34, 145, 279-280; early childhood care and education,

280-281; education in A.D. 2000, 292-294; pre-school education, 281; universalization of primary education, 282-286

National Population Education Project (Programe), viii, ix, xi, 7, 9, 34-38, 111; audio-visual materials in, 37, and co-curricular activities, 35, 37; documentation, 37; effective integration, 35, 36; and evaluation, 35, 37; directions, 35-38; and national policy on education, 36; and research, 37-38; and teacher training, 35-36

National population policy, ix, 26-27 106-111

National Programme for Prevention of Blindness, 208

National Sample Survey Organization, 202

National Seminar on Population Education, ix, 9, 30, 32, 33, 34

National Source Book, viii, ix; basic purposes of, x-xi, need for viii-x; organization of, xi-xiii; primary audiences of, xi

National Tuberculosis Control programme, 206, 207

National Wastelands Development Board, 168

Natural contraception, 27, 266-269

Natural rate of increase, 298

Natural resources, 151, 152, 153, 173-183

Natural sciences, 8

Nehru, Jawaharlal, 107

Neo-natal mortality, 197, 320

Nepal, 5

Net migration, 298

Net migration rate, 298

Net reproduction rate, 27, 78, 298

New Zealand, 44

Nilgiris, 171

Nitrogen oxide, 176, 177, 324

Nitrous oxide, 165

Nocturnal emissions, 246

Nokrok, 171
 Non-communicable diseases, 200-202
 Non-conventional sources of energy, 179-182
 Non-formal education, ix, xi, 7, 35, 36, 282-283, 286
 Non-renewable resources, 173-174
 North America, 44, 163
 Northern Africa, 44
 North Atlantic Treaty Organization, 4
 NPK, 155, 157
 Nuclear power generation, environmental impact, 177-179
 Nutrition, 28, 197, 209-229, 327-329; and child survival, 216-217; and family size, 217-219; and fertility, 213-216; health and, 34, 209; national programmes, 225-228; population and, xiii, 34, 209-229; and vulnerable groups, 212-213; and women, 132-138
 Nutritional deficiency diseases, 219-224
 Nutrition Intervention Programmes, 227-228
 Nutritional service indicators, 187
 Nutritional status, 209, 327; and family size, 217-219
 Nutrition survey data, 224
 Nutritionally vulnerable groups, 212-213

O

Observance of small family norm, 28
 Occupation and fertility, 81
 Ocean energy, 179, 182
 Ocean pollution, 153, 162
 Ocean Thermal energy, Commission, 182
 Oil Pollution, 162
 Operation Blackboard, 288
 Operation Research Group, 122
 Optimum theory of population, 278-279

Oral pills, 271-272
 Oral rehydration salt, 207; therapy, 207
 Orissa, 51, 53, 55, 58, 60, 133, 149, 155, 195, 285, 292
 Ozone, 165, 166
 Ozone depletion, 153, 165-166
 Ozone layer, 165, 166, 324-326

P

Padmanabha; P., 62
 Pakistan, 43, 50, 66, 134
 Parity, 71, 76
 Parliament, Indian, 116
 Particulates, 163, 176
 Pathfinder Fund, 34
 Pearl, Raymond, 99
 Pediculosis, 356
 Penicillium, 170
 The Pennar, 161
 Pennsylvania, 178
 Per capita income, 32
 Per capita land, 151
 Pesticides, 174, 176
 Philippines, 10, 17
 Physical health, 185
 Physical Quality of Life Index, 188, 277
 Plague, 159
 Planning, 278
 Plato, 106
 Policy intervention, 26-27
 Poliomyelitis, 200
 Pollutants, 152, 163, 171
 Pollution, 152, 158, 159, 160-166, 170, 172
 Pondicherry, 52, 54, 56, 59, 62, 63, 134, 285

Population, 1-6, 25-26, 41-111, 115-116, 191-194, 278-279, 286-291; and development, xii 1-6, 25-27, 33, 115-126; and environment and resources, xii, 34, 151-182; and health, xii, 34, 185-208; and nutrition, xii, 34, 209-229; and women and development, 129-149

Population card, 25

Population change, components of, 71-98; and education, 277-294; and quality of life, 13-16; and resource development, 34

Population density, definition, 60-61, in states and union territories, 61-63

Population distribution, 50; by zones and states, 50-57

Population dynamics, x, xii, 11, 30, 34, 41-111

Population education, beyond knowledge base of, x; conceptual issues, 17; conceptualization of, ix, x, 9-14; contents of, viii, x, xii, 7, 8, 18, 20, 32, 33, 36; curriculum, 7, 17-18, 30; definition of, 10-11, 32-34; as an educational innovation, xii, 27; emergence of, viii, 7-9; evaluation and research in, x, 19, 37-38; and family life education, ix, xiii, 14-15, 21, 231-234; in global perspective, xii, 1-22; in historical perspective, 7-9; in Indian perspective, xii, 25-39; institutionalization of, ix, 20, 35, 36; integration approach, viii, 17, 31-32, 35, 36; interdisciplinary nature of, xi, 17; as an intervention strategy, viii, 27, 29-30, 31; issues

in, 16, 17-20; knowledge base of, viii, ix, x, xi, xii, xiii; methodologies of teaching, 18; multidisciplinary nature of, xi, 17; need for, 6-7, 27, 29, 30-32; non-prescriptive approach, 17, 20; objectives of, viii, ix, 14-16, 17, 19, 33, 34; operational issues in, 19-20; pedagogical aspects of, xi; and population distribution, 15; and population growth, 14; and quality of life, 11-14, 15-16; as a separate course, 21; specific objectives of, 15-16; state-of-the-art, x, xi; training in, 18-19; trends in, 20-21; value-laden area, 16, 31; and world plan of action, 8

Population education programme, (see National Population Education Project)

Population Education Unit, 34

Population enumeration checks, 49

Population estimates, 42, 45, 46-47, 98-106; definition, 100; methods of, 101-102; and projection, prediction, forecast, 100-101; types of, 101; uses of, 99-100

Population explosion, xii, 2, 78, 191-194; consequences of, 26, 41, 151-152, 191-194, 286-291

Population momentum, 6, 298

Population policy, 7, 8; definition, 106; of India, xii, 26-30, 107-111; of Malaysia, 107; of Soviet Union, 107

Population projection, component method, 99; definition, 100-101; and estimates, prediction, forecast, 100-101; history of, 98-99; in India, 102-106; logistic curve, 99; methods of, 101-102; types of, 101; uses of, 99-100

Population Reference Bureau, 42

Population related beliefs and values, 34

Population situation, xii, 25-26, 33, 41-71

Population studies, 33; need for, 278-279

Population, world, 1-2, 25, 41-45, 151; age structure of India, Philippines, Sweden and U.S.A., 70-71, 72-75; and consumption explosion, 3; and consumption style, 3-6; of

developed and less developed regions, 42-45; population policy, 106-107

Population, India, 1, 25-27, 115-116; age composition, 67-70; causes of death in infants and children, 91-93; crude birth rates, 78-80; crude death rates, 86-87; demographic goals, 26-27, 110-111; demographic trends, 304; density, 60-63; and development, 1-6, 26-27, 115-126; distribution by broad age-groups, 69-70; distribution by zones and states, 50-57; educational intervention, 27; and education policy, 27-29; expectation of life at birth, 87-88, 116; fertility, 71-82; a great divide, 25; growth, 57-60; growth in modern period, 47-50; growth in pre-modern period, 45-47; growth of urban

population, 63-65; infant and child mortality, 88-91; levels and trends of mortality, 86-92; migration, 93-98; migration trends, 97-98; mortality, 83-93; policy intervention, 26-32; projection, 102-106; sex and age composition, 65-71; sex and age composition of projected population, 103-106; sex composition, 66-67; sex ratio, 131-132; size and growth, 45-50; socioeconomic variables affecting fertility, 80-82

Post-natal mortality, 320

Pregnancy, antenatal care, 340-341; essential needs, 341-342; outcome, 215; signs and symptoms of, 340

Pre-marital sex, 246

Pre-school education, 281

Prevention of Immoral Traffic act, 148

Primary Health Centres, 82, 109

Productivity education, 33

Pro-natalist values, 6, 29, 34

Protein-energy malnutrition, 219, 220-222, 328, 329

Psychology, viii

Puberty, 241-242, 243, 257, 263, 330, 334, 337

Puga Valley, 182

Punjab, 51, 53, 55, 58, 61, 133, 159, 170, 171, 223, 285, 292

Q

Quality of life, 2, 15, 16, 17, 25, 26, 28, 33, 34, 38, 43, 155, 188; concept of, 13-14; education and, 272-278; and environment, 152, 153; indicators of, 188; interrelations among factors of, 11-12

R

Radhakrishnan, S., 145, 279

Rajasthan, 51, 53, 55, 57, 58, 60, 61, 62, 79, 111, 133, 149, 154, 155, 195, 284, 285, 290, 292

Rajkrishna, 294

Rate of natural increase, 298-299

Rawlands, Sherry, 324

Recycling of resources, 171-172

Reed, Lowell J., 99

Renewable resources, 173-174

Reproduction, 6, 257-264

Resources, 26, 151, 152, 153; crisis, 3; degradation of, 152, 153; and development, 153; living and non-living, 173; and population growth, 153; recycling of, 171-172; renewable and non-renewable, 173-174

Removal of social barriers, 28

Research, x, xi, 37-38

Responsible parenthood, 34

Rhythm, 267

Rural functional literacy projects, 290

Russia, 99

S

The Sabarmati, 161

Saccharum spontaneum, 169

Safe drinking water, 151

Salinization, 152, 174

Sampurnanand Committee, 279

Satellite surveys, 162

Saxena, P.C., 90

Scabees, 357

School education, ix, xi, 35

Sciences, 8, 30

Secondary Education Commission, 279

Secretary-General of United Nations, 5

Self-concept, 345

Self-esteem, 343-344

Sen, Amartya, 294

- Sex, 237-238
- Sex-age composition, 65-71, 103-106
- Sex-age pyramids, India, 72; Phillippines, 73; Sweden, 74; United States of America, 75
- Sex composition, 66-67
- Sex education, ix, 9, 10, 17, 21, 32, 33, 232, 248, 257; need for, 236-237
- Sexuality, 232; adolescence, 240-247; childhood, 239; definition, 237-238; infancy, 238-239; pre-adolescence, 240; problems of adolescent, 245-254; stages in, 238-245
- Sex-ratio, 66-69, 131-132, 133-134; definition, 299
- Sexually transmitted diseases, 34, 272-274, 346-359
- Second Five Year Plan, 107, 108, 190, 194
- Seventh Five Year Plan, 9, 107, 108, 111, 190, 194, 289, 293
- Shah, K.T., 130
- Shelter, 119-120
- Sikkim, 51, 53, 55, 58, 60, 61, 133
- Silent Valley, 177
- Siltation, 154, 155
- Simon, Julian, 2
- Singapore, 5
- Singh, Káran, 125
- Sinha, U.P., 90
- Sixth Five Year Plan, 107, 108, 110, 117, 190, 194
- Small family norm, 11, 20, 26, 28, 29, 33, 34, 38
- Slums, 151
- Social and mental health indicators, 188
- Social development, 34
- Social forestry, 168
- Social health, 186
- Social policy, 7
- Social sciences, 8
- Social studies, 8, 30, 31, 152, 153
- Socio-cultural norms, 34
- Socio-cultural values, 6
- Socio-economic development, x, 15, 115; indicators, 118, 300-303
- Sociology, viii, 32
- Soil degradation, 155
- Soil erosion, 152, 153, 154-155, 174
- Solar energy, 179
- Sources of data, for death statistics, 83; for fertility analysis 76; for migration, 95
- South Asia, 44
- Southern Africa, 44
- Spacing method, 269-272
- Spatial mobility, 93
- Special Nutrition Programme, 226
- Spermicides, 270
- Sri Lanka, 15
- Srinivasan, K., 90
- Sri Prakasha, 279
- Sri Venkateswara University, 34
- Stable population, 299
- Status of environment, 151-152
- Status of women, 34, 129-149
- Stockholm Conference on Human Environment, 152
- Stratosphere, 165, 166
- Stress-related illness, 137
- The Subarnarekha, 161
- Sulphur dioxide, 163, 164, 325
- Survival ratio, 299

Suspended particulate matter, 163
 Sustainable development, xii, 6, 7, 152-153, 170, 172, 173
 Swadeshi movement, 118
 Sweden, 5
 Sympto-thermal, 268-269
 Syllabus on population education, 32-34
 Syphilis, 273, 349-351

T

Tamil Nadu, 52, 54, 56, 59, 60, 61, 133, 140, 200, 284, 285, 290, 292
 The Tapti, 161
 Teacher education ix, xi, 35, 36
 Teaching methods, 18
 Teenage abortions, 246-247
 Teenage pregnancy, 246-247
 Temperate South America, 44
 Tera-elthyl lead, 163
 Tetanus, 200
 Thailand, 6, 14, 26
 Thermal power generation environmental impact, 176-177
 Third Five Year Plan, 108, 109, 116, 190, 194
 Third world countries, 5
 Thomson, warren S., 7
 Three Mile Island, 178
 Toffler, Alvin, 119
 Total fertility rate, 77, 299; in India and States, 311; rural-urban, 310
 Total marital fertility rate, 299
 Trachoma, 200
 Tragedy of the Commons, 3
 Tree Patta, 168

Tripura, 51, 53, 55, 58, 60, 62, 133, 223, 283.

Tropical South America, 44

Tubal sterilization, 272

Tuberculosis, 198-199

Tunisia, 5

U

Ukraine, 178

UNESCO, viii, 8, 9, 277

UNFPA, 9

UNICEF, 124

Union of Soviet Socialist Republic, 43, 44, 151, 178

United Arab Republic, 5

United Nations, 5, 8

United Nations General Assembly, 129, 130

United Nations Decade for Women, 129

United Nations Declaration on population, 5

United States Immunization Programme, 208, 225

Universalization of Primary Education, and census 282; constitution of India, 282; Compulsory Primary Education Acts, 282; and dropout phenomenon, 284; expenditure on, 283-290; gross enrolment ratio, 283; incentive schemes, 284; and non-formal education, 284; performance of, 283-284; and population growth, 284, 286-290; and quality of school, 288; schooling facility, 287; teacher-pupil ratio, 287-288

University education, xi, 9, 31

University Education Commission, 279

University Grants Commission, 37

Urbanization, 34, 138, 151

Urban population, 63-65, 299; definition, 63; and size-class of cities, 64-65, 161-162

Usufruct rights, 168

Uttar Pradesh, 50, 51, 53, 56, 59, 62, 79, 111, 133, 149, 155, 169, 170, 195, 223, 284, 286, 290, 292

U.V. radiation, 165, 166

V

Vaginitis, 357-358

Van Mahotsava, 168

Varshney, C.K., 163

Vasectomy, 272

Venereal warts, 356

Verhulst, P.F., 99

Vietnam, 14, 15

Virgin, 252

Visual impairment, 201-202

Vitamin A deficiency, 222, 329

Vitamin A Prophylaxis Programme, 226

Values, 6, 15, 16, 19, 21, 27, 28, 29, 31, 37, 231, 232, 235, 240, 243, 277

Value education, 33

W

Warsaw Pact, 4

Wastes, agricultural, 172, 181; animal, 161, 172, 181; city, 171; distillery, 181; domestic, 163, 171, 181; human, 161, 172, 181; industrial, 161, 172; inorganic, 171; kitchen, 161; nuclear, 178; organic, 171, 180, 181; radioactive, 178; solid, 161, 171, 172; water, 171

Waste utilization, 171-172

Water, 120

Water borne diseases, 161, 172

Water Decade, 120

Water pollution, 152, 156, 159, 160-162, 172-173

Water (Prevention and Control of

Pollution) Act, 196

Wattal, P.K., 107

Wayland, Sloan, 7

West Bengal, 51, 53, 55, 58, 60, 62, 133, 155, 223, 284, 285, 286, 292

Western Africa, 44

Western Europe, 3

Whooping cough, 200

Wild animals, 154, 157, 169-171

Wild life, 153, 154, 156-157, 158, 160, 166, 173,

Wild plants, 157, 169-171

Wind energy, 179-180

Women, access to nutrition and health care, 132-138; and economic activity, 145-146; and education, 142-145; and family planning, 141; and law and media, 148-149; maternity and child care, 138-140; sex ratio and, 131-132, 133-134; status of, 129-131

Women education, 142-145

Working Group on Population Policy, 110

Workshop on Population and Family Education, 8

World Bank, 227

World Commission on Environment and Development, 152

World Conference of the International Women's Year, 129

World Health Organization, 4, 124, 185

World Watch Institute, 25

Y

Yugoslavia, 5

Z

Zero population growth, 27, 299